Valley Water

Climate Change Action Plan

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Executive Summary

Climate change will create numerous and often critical challenges to the Santa Clara Valley Water District (Valley Water) water supply, flood protection, and ecosystem stewardship mission areas. Today, Valley Water mitigates greenhouse gas emissions to reduce its contribution to climate change. Valley Water also adapts, plans, and prepares for projected impacts of climate change. Valley Water’s Climate Change Action Plan (CCAP) builds upon Valley Water’s existing climate change response efforts and presents goals and strategies to continue and expand these efforts. The CCAP is both a plan to reduce greenhouse gas emissions, and a framework to ensure a safe and resilient water supply in the future. The CCAP provides a comprehensive guide to Valley Water’s current and future climate change mitigation and adaptation efforts. Chapter 1 further describes the purpose of this CCAP, describes Valley Water’s existing efforts related to climate change and provides an overview of greenhouse gas (GHG) emissions in recent years.

Climate change is expected to alter local climate in Santa Clara County, Valley Water’s service area. Chapter 2 describes past climate and projected climate changes in Santa Clara County. Projected impacts are assessed under two emissions scenarios, an intermediate scenario and a “business as usual” scenario. The temperature in Santa Clara County is projected to rise by 1.8˚F by 2050 under the intermediate scenario or by 2.0˚F by 2050 under the business as usual scenario. Precipitation may increase in overall volume. Extreme heat and precipitation events are likely to increase in frequency. Santa Clara County is also expected to experience more frequent and severe droughts, increased risk of wildfire, increased threats to surface water quality, and sea level rise. California’s snowpack, a source of Valley Water’s imported water supply, is expected to decline as a result of climate change.

Changes in air temperature, precipitation, and other climatic changes challenge Valley Water operations in numerous ways. Water supply reliability will be challenged by changes to local and imported water supplies and surface water quality. Increasing storm intensity and sea level rise will complicate flood protection efforts. Local ecosystems may degrade in response to declining water quantity and quality, drier soils, floods, droughts, stream channel erosion or incision, wildfires, invasive species, and other possible climate change impacts. This will threaten the success of ecosystem stewardship efforts, as well as permit-required habitat mitigation.

An assessment was conducted to thoroughly assess vulnerabilities and associated risks to Valley Water operations. Chapter 3 reviews the results of this vulnerability and risk assessment. The assessment identified specific operations that are vulnerable to climate change impacts and established risk levels ranging from low to extreme for these vulnerabilities. Risk levels were determined using the average of rankings assigned by the members of staff workgroups representing all areas of Valley Water operations. The results of this assessment are organized according to Valley Water's mission areas—water supply, flood protection, and ecosystem stewardship— and show that each area of Valley Water's operations will be vulnerable to climate change. In order to address these risks, Valley Water needs comprehensive goals and strategies to guide the agency's climate change efforts into the future.

Goals, strategies, and possible actions were developed to guide Valley Water's climate change efforts, and are described in Chapter 4. There are seven goals—three mitigation goals and four adaptation goals. The mitigation goals correspond to an internationally recognized system of carbon accounting that divides emissions into three scopes: direct emissions, purchased electricity, and indirect emissions. The adaptation goals correspond to Valley Water's three mission areas, with an additional goal to address emergency preparedness. Each goal contains strategies offering guidance on how to achieve the goal. Finally, each strategy includes possible actions, which are the most specific tool included in this CCAP. Some actions have already been undertaken by Valley Water, while others are new methods of mitigating or adapting to climate change.

The CCAP presents next steps for approval by Valley Water's Board of Directors in Chapter 5. The first recommended action is to update Valley Water's climate neutrality policy, as the target set in the existing policy has been achieved. The next recommended action is to develop the CCAP's Implementation Program. Climate change impacts are inherently complex. The strategies for mitigating and adapting to these impacts are similarly complex, requiring iterative and inclusive planning that responds to new data and incorporates new solutions and technologies as they emerge. The Implementation Program is intended to facilitate the prioritization and development of specific actions and the development of workplans. It will also monitor progress towards climate resilience. The possible actions developed in the CCAP may guide the development of final actions in the Implementation Program, which will be structured to allow for flexibility and responsiveness. It is recommended that the implementation of this CCAP is guided by an inclusive and iterative process that fosters collaboration to maximize climate resilience, led by a designated team. Valley Water's Board of Directors, agency staff, stakeholders, and the public will be regularly updated on Valley Water's progress towards the CCAP's goals.

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List of Abbreviations

CA EMA	California Emergency Management Agency
CCAP	Climate Change Action Plan
CEC	California Energy Commission
CEO	Chief Executive Officer
CVP	Central Valley Project
DWR	California Department of Water Resources
EF	Emission Factor
EV	Electric Vehicle
FAHCE	Fish and Aquatic Habitat Collaborative Effort
FEMA	Federal Emergency Management Agency
GCM	General Circulation Model
GHG	Greenhouse Gas
HAB	Harmful Algal Bloom
IPCC	Intergovernmental Panel on Climate Change
IRWMP	Integrated Regional Water Management Plans
ISO	International Standards Organization
LEED	Leadership in Energy and Environmental Design
LHMP	Local Hazard Mitigation Plan
MT	Metric Tons
NOAA	National Oceanic and Atmospheric Administration
O&M	Operations and Maintenance
OPC	California Ocean Protection Council
OPR	Office of Planning and Research
PG&E	Pacific Gas and Electric
PWRPA	Power and Water Resources Pooling Authority
RCP	Representative Concentration Pathway
SMP	Stream Maintenance Program
SVAWPC	Silicon Valley Advanced Water Purification Center
SWP	State Water Project
Valley Water	Santa Clara Valley Water District
VHP	Valley Habitat Plan
VMT	Vehicle Miles Traveled
WSMP	Water Supply Master Plan

Chapter 1: Introduction

1.1. Purpose

Valley Water manages an integrated water resources system that includes the supply of clean, safe water, flood protection, and ecosystem stewardship on behalf of Santa Clara County's nearly two million residents. Managing climate change-related challenges is critical to fulfilling Valley Water's mission. The purpose of this Climate Change Action Plan (CCAP) is to guide Valley Water's climate change response through the development of goals and strategies that:

- reduce Valley Water's contribution to climate change by reducing greenhouse gas (GHG) emissions (mitigation); and
- enable Valley Water to adapt to the potential impacts of climate change in each of Valley Water's mission areas.

The CCAP describes future climate impacts as well as agency-specific vulnerabilities and risks associated with climate change. The CCAP is intended as a plan that provides goals, establishes strategies, suggests possible actions, and proposes the development of an implementation program to achieve these goals and strategies. The program will instill climate resilience as a priority throughout Valley Water's many areas of work and will build and expand upon Valley Water's many existing climate-related efforts.

1.2. Plan Development

Valley Water's Board of Directors has actively responded to climate change by adopting policies to address climate change, as described in section 1.3. Valley Water's CEO established a "Framework for Managing Climate Change Adaptation and Mitigation" in December 2013 that established a structure to meet Board policy on climate change, including a broad team of subject matter experts. The Board of Directors and CEO directed staff to develop the CCAP in order to have a more detailed and comprehensive plan to guide Valley Water's climate change mitigation and adaptation efforts. The CCAP replaces the framework, and the CCAP will be updated on a regular basis. Although the framework has been replaced, its team of subject matter experts on climate change has been maintained (see Appendix A). While a variety of staff throughout the District will work towards implementing the CCAP, knowledge or assistance from these subject matter experts may be obtained to facilitate the implementation of the CCAP.

The development of this CCAP started in late 2017, when a series of interviews with unit managers was conducted to identify perceived climate risks throughout Valley

Water's work area. The results of these interviews and subsequent collaborative efforts with internal stakeholders are the foundation of this plan.

The development of this report followed a methodical, multi-step process that included:

- Evaluating the projected impacts of climate change on Santa Clara County and the regions that provide Valley Water's imported water supply,
- Assessing Valley Water's vulnerabilities to these impacts,
- Developing goals, strategies, and actions to address these vulnerabilities, and
- Preparing a framework for a CCAP Implementation Program that will carry out the goals set forth in this plan.

The structure and final content of this report was identified following a thorough benchmarking process, which included a review of numerous other CCAPs and climate planning documents[1]. This process identified that, while there are many ways of organizing an agency or municipality's climate mitigation and adaptation strategies, our plan is generally consistent with the types of efforts taken to address climate change mitigation and adaptation, when relevant.

In addition to ensuring consistency with other CCAPs, this plan is structured to reflect Valley Water's role as a water management agency. Each of Valley Water's mission areas is represented with a specific set of adaptation strategies, which have been developed based on the input and expertise of Valley Water staff.

These steps are the first part of a long-term program that will improve Valley Water's climate resilience. This plan is the product of a collaborative process, which incorporated staff input from all areas within the agency. Climate change will not impact every aspect of Valley Water operations equally, so continued collaboration will be important to ensure that work groups' individualized needs are met.

1.3. State Level Climate Change Policies and Plans

California has enacted numerous regulations to address climate change as risks and impacts associated with it have become widely recognized. Although Valley Water is not legally required to adopt a CCAP, this document complements existing State policies and programs that pertain to climate mitigation and adaptation issues. The most relevant policies and plans that intersect with the scope of this CCAP are summarized below.

Climate Mitigation

The State has established reduction goals for GHG emissions through a series of legislative actions and Governor's Executive Orders. With the passage of Assembly Bill (AB) 32 in 2006,

[1] Documents from the Cities of San Jose, San Mateo, Berkeley, County of Santa Cruz, Midpeninsula Regional Open Space District, San Diego County Water Authority and Institute for Local Government.

California adopted its first target for reduction of GHG emissions, which required statewide reduction of emissions to 1990 levels by 2020[2]. In 2016, an emissions reduction target for 2030 was subsequently established with the passage of Senate Bill (SB) 32. SB 32 requires statewide emissions reduction to 40 percent below 1990 levels by 2030. Another statewide target was established though executive action in 2018 with the enactment of Executive Order (EO) B-55-18. Although not yet codified into State law through legislative action, EO B-55-18 established 2045 as the target year to achieve statewide carbon neutrality.

The California Air Resources Board (CARB) is the State agency responsible for monitoring GHG emissions and implementing policies that target climate mitigation. CARB guides progress towards the State's emissions targets through its Climate Change Scoping Plan, which was first developed in 2008 and most recently updated in 2017. The Scoping Plan articulates broad strategies and standards to facilitate emission reduction across the energy, transportation, industrial, water and other sectors, but it does not include specific emissions mandates for local agencies. Scoping Plan goals specific to the water sector encourage water supply reliability, conservation and efficiency and increased use of renewable energy to pump, convey, treat and utilize water (CARB 2017).

Climate Adaptation

Climate adaptation is addressed at the State level though numerous initiatives spearheaded by various State agencies. California's first centralized effort to engage in long-range adaptation planning was led by the California Natural Resources Agency (CNRA) and produced the *California Climate Adaptation Strategy* in 2009. CNRA has since developed updated iterations of this plan, now known as the *Safeguarding California Plan*. Published in 2018, the most recent edition of *Safeguarding California Plan* addresses adaptation planning in the water sector by articulating goals and next steps to promote and improve regional groundwater management, diversification of local water supplies, flood preparation and ecosystem protection (CNRA 2018). Additionally, California Governor's Office of Emergency Services published an updated *Adaptation Planning Guide* in 2020 to provide local governments and agencies a step-by-step guide to plan and implement climate change adaptation efforts with the latest best practices, science, and regulations. This was published alongside the Governor's Office of Planning and Research's "Adaptation Clearinghouse" which compiled resources, tools, and case studies across California for the use of climate adaptation planning across the state, including but not limited to the updated *Adaptation Planning Guide*.

Recent legislation also acknowledges the risk that climate change poses to critical infrastructure. Enacted in 2016, AB 2800 requires state agencies to account for the current and future impacts of climate change when planning, designing, building, operating, maintaining and investing in infrastructure. Though Valley Water is not a state agency itself,

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[2] California achieved the AB 32 emissions target in 2016.

the strategies related to climate resilient infrastructure will help to meet the goals of this legislation given Valley Water's close partnerships with state agencies and the infrastructure operated by Valley Water that is in need of resilience updates. The legislation also created the Climate-Safe Infrastructure Working Group which published *Paying It Forward: The Path Toward Climate-Safe Infrastructure in California*. This report considers how climate related risks, such as sea level rise, extreme precipitation and heat and wildfire could threaten the safety and dependability of infrastructure, including dams, pipelines and water treatment plants. Among other takeaways, the report recommends adaptive infrastructure design practices, construction standards that enhance collaboration between state agencies and special districts that maintain critical infrastructure like Valley Water (CCSIWG 2018).

1.4. Existing Climate Change Efforts at Valley Water

Mitigation-Related Board Policies and Efforts

Valley Water's Board of Directors adopted Ends Policy 4.3.1 to guide Valley Water towards carbon neutrality. Board Ends Policy 4.3.1, implemented in 2013, directs Valley Water's Chief Executive Officer (CEO) to reduce GHG emissions to achieve carbon neutrality by 2020come from water conservation and other practices or activities that reduce GHG emissions, such as recycled water, and carbon sequestration from wetland and riparian restoration, green business programs, and energy optimization measures.

Mitigating greenhouse gas emissions through the use of solar panels on carports.

Valley Water is currently engaged in several efforts to mitigate climate change, as shown below.

- Executive Limitation 4.9.3, a climate divestment policy, which prohibits investment in fossil fuel companies with significant carbon emissions.
- Establishing a District-wide internal carbon offset methodology to facilitate emission reduction, including crediting emission reductions from water conservation programs, habitat restoration or enhancements, renewable energy production and contributions to countywide emission reduction efforts.
- Increasing fleet fuel use efficiency.
- Maintaining a portfolio of alternative renewable energy supplies.
- Increasing operational energy use efficiency.
- Identifying and developing opportunities to employ sources of alternative energy that reduce GHG emissions.
- Conducting periodic GHG emission inventories.
- Supporting Santa Clara County's Green Business Program.

Adaptation-Related Board Policies

Along with its carbon neutrality policy, additional Valley Water policies and guidelines address other elements of climate change readiness. These policies are:

- Ends Policy E-2 sets the goal for a "reliable, clean water supply for current and future generations."
- Ends Policy E-3 sets the goal of a "healthy and safe environment for residents, businesses, and visitors, as well as for future generations." This policy specifically mentions the objectives of natural flood protection and reducing flood damages.
- Ends Policy E-4 sets the goal of "water resources stewardship to protect and enhance watersheds and natural resources and to improve the quality of life in Santa Clara County."

Ends Policies E-2 and E-3 highlight the importance of maintaining quality of life for future generations. In order to ensure that this is possible, it is important for Valley Water to consider Santa Clara County's changing climate baseline in planning and implementing projects. These board policies are listed in Appendix B.

Relevant Plans and Programs

There are numerous plans and programs already being implemented that respond to climate change. Some of these plans are led by Valley Water, while others are collaborative efforts in which Valley Water is one of multiple participants.

Valley Water’s plans and programs that are relevant to climate change are included in Table 1.

Table 1: Valley Water Plans with Links to Climate Change

Plan Name	Description and Relevance to Climate Change
Groundwater Management Plan (GWMP)	The GWMP provides a groundwater management framework, including authorities, goals, programs, and metrics to assess performance. The plan is written to conform with the standards of the California Department of Water Resources (DWR) for Groundwater Sustainability Plans (GSPs). Under the Sustainable Groundwater Management Act (SGMA) designated Groundwater Sustainability Agencies (GSAs) are required to prepare for medium and high priority groundwater basins. Valley Water is the GSA for the Santa Clara and Llagas subbasins. The GWMP identifies climate change impacts with the potential to affect groundwater resources and sets goals to ensure that groundwater is sustainably managed in the context of climate change impacts and other threats to groundwater.
Local Hazard Mitigation Plan (LHMP)	The LHMP, developed by Valley Water and approved by FEMA, identifies potential hazards to local communities, determines the likely impacts of these hazards, and sets mitigation goals to lessen these impacts. This plan is intended to maintain public safety, avoiding damage or loss to life, property, and community. Climate change may result in increased risk of the hazards addressed in the LHMP. The LHMP includes actions intended to reduce the severity of the identified hazards. One such action is to "conduct hazard vulnerability studies, including anticipated climate change impacts, in advance of all new infrastructure siting and construction".
One Water Plan	The One Water Plan provides a long-term vision for integrated water resources planning on a watershed scale. It is intended to serve as Valley Water's flood management and stream stewardship master plan. The One Water Plan describes objectives, one of which addresses climate change, and projects associated with this plan will need to address climate change projections in order to maintain and improve watershed health. The One Water Plan goals, strategies, and actions related to climate change are consistent with those in the CCAP.
Urban Water Management Plan (UWMP)	The UWMP documents important information on water supply, water usage, recycled water, water conservation programs, water shortage contingency planning, and water supply reliability in Santa Clara County. It also serves as a valuable resource for water supply planners and policy makers and addresses the water supply future of Santa Clara County over the next 25 years, recognizing that climate change represents a threat to long-term water supply viability. State law requires that the plan be updated every five years and the current UWMP was updated in 2015.

Safe, Clean Water and Natural Flood Protection Program (SCW)	This program, which is funded by a parcel tax on Santa Clara County property owners, was created to fund projects that maintain a safe water supply, improve water quality in county waterways, ensure that water supply is safe from natural disasters, restore habitat and provide open space, and provide flood protection. Renewal for the SCW is on the ballot for 2020. The effectiveness of projects in each of these priority areas may be impacted by climate change. The community preferred plan for the SCW renewal specifically addresses climate change.
Santa Clara Basin Stormwater Resource Plan (SWRP)	The Santa Clara Basin SWRP is a collaborative planning document that develops stormwater and dry weather runoff capture projects to improve water quality. The Santa Clara Basin SWRP was developed by Valley Water and the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP). The green stormwater infrastructure projects identified in the Santa Clara Basin SWRP are intended to improve water quality but provide multiple benefits including climate change resiliency by reducing runoff, building resiliency to drought via groundwater recharge and augmentation of water supplies, reducing urban heat island effects, and contributing to sequestration of carbon. Each of these project outcomes can be beneficial steps towards mitigating and adapting to climate change.
South County SWRP	The South County SWRP identifies water quality issues and presents local and regional stormwater projects that provide water quality benefits. The South County SWRP was developed by Valley Water, the City of Gilroy, the City of Morgan Hill, and the County of Santa Clara. As with the Santa Clara Basin SWRP, projects identified increase resilience and provide multiple benefits.
Stream Maintenance Program (SMP)	The SMP was developed to streamline the process of maintaining the 275 miles of creeks and streams managed by Valley Water in a manner that minimizes environmental impacts. The SMP guidance manual is periodically updated to reflect current conditions. The current manual does not specifically address climate change, but it is likely that future iterations of the SMP will be affected by climate change impacts to Valley Water's creeks and streams.
Water Supply Master Plan (WSMP)	The WSMP presents Valley Water's strategy for meeting water supply needs for the next 20 years. It includes strategies for making effective and efficient water supply decisions that balance stakeholder values, climate change impacts, policy changes, and uncertainty. The WSMP contains a Monitoring and Assessment Program that is intended to assist Valley Water in adapting to climate change and other changes to water supply.

Valley Water also actively participates in collaborative efforts to address climate change impacts. Regional plans, projects, and programs which further climate change resilience in Valley Water's mission areas are included in Table 2.

Table 2: Collaborative Efforts with Links to Climate Change

Plan Name	Description and Relevance to Climate Change
South Bay Salt Pond Restoration Project	The South Bay Salt Pond Restoration Project is the largest tidal restoration project on the West Coast. When completed, it will provide new habitat space, recreational areas, and improved flood protection. The project has been designed to manage coastal flood risk through raising existing levees, adding fill, and/or installing new levees. This will increase Santa Clara County's resilience to coastal flooding from sea level rise and improve habitat resilience through restoration of vital marshes.
South San Francisco Bay Shoreline Project	The South San Francisco Bay Shoreline Project is a Congressionally authorized study by the US Army Corps of Engineers together with the Valley Water and the State Coastal Conservancy to identify and recommend flood risk management projects for Federal funding. The study and associated projects respond directly to sea level rise, aiming to address the potential for increased coastal flood risk due to sea level rise.
Integrated Regional Water Management Plans (IRWMP)	Valley Water participates in two IRWMPs (the San Francisco Bay Area IRWMP and the Pajaro River Watershed IRWMP), which are collaborative efforts to "identify and implement water management solutions on a regional scale that increase regional self-reliance, reduce conflict, and manage water to concurrently achieve social, environmental, and economic objectives". These plans consider climate change vulnerabilities with the potential to affect water management and identify general mitigation and adaptation strategies that could address the specific impacts anticipated in the plan area.
Valley Habitat Plan (VHP)	The VHP, led by the Santa Clara Valley Habitat Agency, was developed to provide streamlined permitting for projects and a method for addressing project impacts on endangered and threatened species/ habitats. Climate change impacts will affect habitat conditions within the VHP area. The VHP includes a climate change assessment that summarizes climate regulations, includes projections of climate change impacts, and explains likely impacts to the plan area. The climate change assessment also includes a conservation strategy and Adaptive Monitoring and Adaptive Management procedures intended to address projected impacts of climate change and limit adverse effects on the environment.
Silicon Valley 2.0	Silicon Valley 2.0 is Santa Clara County's climate adaptation plan. It examines potential climate change impacts and associated adaptation strategies in a variety of areas, including shoreline flood protection, water, and wastewater. Some of the actions included in Chapter 4 of this CCAP are adapted from Silicon Valley 2.0.

The plans and programs listed above include a wide range of projects in all of Valley Water's mission areas. The CCAP encourages implementation of these plans and offers additional actions that could be implemented to further strengthen climate resilience. Appendix C contains links to each of the plans and programs listed above.

Carbon Accounting

Valley Water calculates emissions inventories annually to evaluate progress towards carbon neutrality. The inventories date back to 2010 and measure both GHG emissions and carbon offsets. Valley Water does not have a baseline year for emission reductions because carbon neutrality is calculated individually for each calendar year. Updates on the status of carbon neutrality are provided regularly to Valley Water's Board of Directors, the most recent of which was presented on June 9, 2020.

Valley Water's emissions inventories are divided into three scopes, following methodology from the United States Environmental Protection Agency (USEPA 2018). The division of emissions into these three scopes is the standard practice for carbon accounting[3,4].

- Scope 1 – Direct Emissions (e.g., Valley Water's fleet, equipment, and natural gas use)
- Scope 2 – Purchased Electricity
- Scope 3 – Indirect Emissions (e.g., imported water, employee commutes, and business-related travel)

Valley Water's emissions are offset by various programs and practices, including[4]:

- Water Conservation Program: Valley Water funds programs that drive residential and commercial water conservation, such as rebates for water efficient equipment and low water landscaping. Water conservation in individual homes and businesses reduces end use energy that would otherwise be consumed by heating of water. Emissions calculations conservatively account for 25 percent of emissions offset due to water conservation.
- Recycled Water: Valley Water has developed a supply of recycled water, which is wastewater that purified to a useable quality through multiple levels of filtration. By augmenting the water supply portfolio with recycled water, Valley Water reduces the need to obtain water from more energy intensive sources, such as imported water, and avoids emissions.

[3] Inventories of GHG emissions do not currently include fugitive/process emissions (Scope 1), Valley Water's construction related emissions and solid waste, water use and wastewater generated at Valley Water facilities (Scope 3). Future inventories may account for these emissions sources.
[4] See Appendix D for complete calculation methodology.

- Carbon Sequestration: Natural environments act as a sink of carbon when biological processes remove carbon dioxide from the atmosphere. By maintaining ecosystems in their natural condition and supporting habitat restoration, Valley Water enhances sequestration of carbon and offsets emissions.
- Santa Clara County Green Business Program: Similar to water conservation, Valley Water provides funding for the County's Green Business Program, which encourages practices, such as energy conservation and alternative commuting, that reduce emissions county-wide. Valley Water is also a certified Green Business.
- Energy Optimization: Valley Water's Energy Optimization Plan guides its efforts to promote energy efficiency in its operations by establishing Energy Optimization Measures (EOMs). EOMs call for replacement of outdated and inefficient equipment, retrofitting of facilities and reliability improvements to ensure that Valley Water uses energy as efficiently as possible.

Based on data presented in the Board of Directors update on June 9, 2020, Valley Water was successful in achieving carbon neutrality since 2014. Each of these years, Valley Water's quantity of offset or sequestered emissions was greater than the quantity of reported emissions. Table 3 (below) shows Valley Water's reported emissions and offsets from 2010 to 2017. Appendix D describes the methodology to calculate carbon emissions and offsets.

Table 3: Summary of Valley Water's Estimated Emissions and Offsets (2010 to 2017)

Calendar Year	2010	2011	2012	2013	2014	2015	2016	2017
Emissions in Metric Tons (MT) of CO_2e[5]	**22,100**	**21,800**	**29,800**	**29,700**	**18,500**	**22,200**	**16,200**	**15,300**
Scope 1: Direct Emissions from District Operations	2,200[1]	2,300[1]	2,500	2,800	3,000	2,100	2,100	2,400
Scope 2: Emissions from Purchased Electricity	2,200[1]	500[1]	3,400	4,000	6,000	6,300	200	200
Scope 3: Other Emissions	17,700	19,000	23,900	22,900	9,500	13,800	13,900	12,700
a. State Water Project	14,800	16,100	21,000	20,000	6,600[2]	10,900[2]	12,100[2]	11,000[2]
b. Central Valley Project	0	0	0	0	0	0	0	0
c. Import from San Francisco Public Utilities Commission	0	0	0	0	0	0	0	0
d. Employee Commute	1,500	1,500	1,500	1,500	1,500	1,500	1,700[3]	1,600
e. Business Travel	1,400	1,400	1,400	1,400	1,400	1,400	100[4]	100
Reduction/Sequestration	**22,370**	**23,060**	**24,400**	**23,110**	**24,080**	**24,235**	**19,135**	**19,235**
1. Water Conservation Program	17,100	17,800	18,400[5]	16,700[5]	17,600[5]	17,800[5]	13,900[5]	14,400
2. Recycled water	2,500	2,500	3,000	3,500	3,700	3,400	3,200	2,800
3. Carbon sequestration	500	500	500	500	500	500	500	500
4. Green Business Program	2,200	2,200	2,200	2,200	2,200	2,200	1,200	1,200
5. Energy Optimization Measures	70[6]	60[6]	300[6]	210[6]	80[6]	335[7]	335[7]	335
Carbon Neutrality (positive value indicates exceeding neutrality)	**270**	**1,260**	**-5,400**	**-6,590**	**5,580**	**2,035**	**2,935**	**3,935**

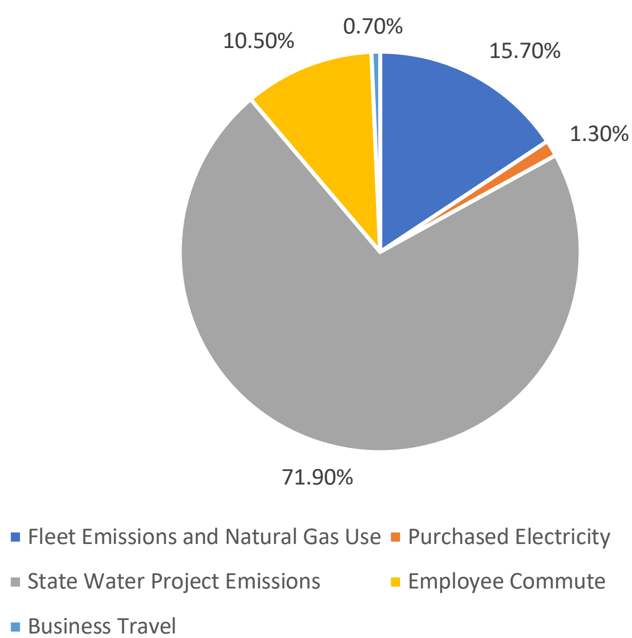
Notes:
[1] Verification completed.
[2] District-specific emissions factor (EF) based on reported EF for CY 2014 through 2016 for the State Water Project. To calculate the EF for the SWP, VW staff utilizes data for DWR and Santa Clara County's water imported from the State Water Project and updates the methodology and data as they become available.
[3] Employee commute data has been updated to include emissions from contract staff and interns.
[4] The factors for calculating business travel were updated.
[5] Adjusted based on decreases in Pacific Gas and Electric's (PG&E) EFs as compared to the 3-year averages of CY 2005 to 2007.
[6] This has been updated using reported energy productions and EFs for each corresponding year.
[7] The update includes energy conservation measures completed in FY 2015 in addition to zero-emission energy production through on site solar and Anderson Hydro.

As shown in Table 3, Scope 1 emissions (Direct Emissions) make up a small percentage of Valley Water's annual emissions. In 2016, this category comprised about 13% of total recorded emissions. In the years shown in Table 3, Scope 2 (purchased energy) emissions fluctuate by almost 6,000 metric tons (MT) CO_2e per year due to Valley

[5] CO_2e, or Carbon Dioxide equivalent, indicates the amount of carbon dioxide that has the equivalent global warming impact as other greenhouse gasses. This creates a common unit to measure greenhouse gas emissions regardless of the type of greenhouse gas.

Water's energy portfolio. Ninety-five percent of Valley Water's purchased electricity is sourced from the Power and Water Resources Pooling Agency (PWRPA), which enables Valley Water to source carbon-free electricity from utility-scale solar and hydroelectric projects. Emissions from PWRPA's electricity vary if environmental conditions change the availability of these forms of electricity. Valley Water's Scope 2 emissions can increase when droughts limit hydroelectricity production and decrease when Valley Water is able to procure a higher percentage of carbon-free energy, as it did in 2016. Purchased electricity made up only one percent of total emissions in 2016. As shown in Table 3, emissions from importing water from the State Water Project (SWP) consistently make up the largest percentage of Valley Water's GHG emissions. Other sources of imported water—the Central Valley Project (CVP) and water distributed by the SFPUC from the Hetch Hetchy system—use hydropower and therefore do not contribute to Valley Water's emissions. In 2016, emissions from imported water comprised about 75% of total emissions. These are considered Scope 3 (indirect) emissions. Other Scope 3 emissions from fuel use, employee commutes, and business travel remain relatively constant and make up a small portion of total annual emissions. In 2016, these emissions comprised about ten percent of total emissions.

Figure 1: Valley Water's Greenhouse Gas Emissions by Source (2017)



Based on emissions inventories, Valley Water has achieved carbon neutrality nearly every year since accounting began in 2010, except in 2012 and 2013[6]. Valley Water exceeded its carbon neutrality goal in 2016. That year, Valley Water emitted 16,200 MT

[6] Carbon neutrality has been achieved according to the methodology currently used by Valley Water to inventory and calculate emissions and offsets.

CO_2e but offset 19,135 MT CO_2e. Although data beyond 2017 has not been acquired yet, it is likely that Valley Water's carbon offsets will again surpass carbon emissions in 2020. In 2020, employee commutes were reduced because of the COVID-19 shelter-in-place order, which required most employees to work from home, contributing to reduced emissions.

Chapter 2: Climate Change Projections and Impacts to Valley Water

2.1. Local Climate Change Projections

Climate change may challenge Valley Water's ability to provide a clean, reliable water supply, flood protection, and ecological stewardship in the future. Climate change is expected to alter air and water temperatures; evapotranspiration, precipitation, runoff, and recharge patterns; sea level; storm intensity; drought and wildfire frequency. This chapter includes a discussion of past local climate as well as local climate change projections for Santa Clara County, Valley Water's service area. These projections will need to be updated periodically. While this section focuses on climate change impacts to Santa Clara County, Valley Water recognizes that climate change impacts will also affect the regions from which Valley Water's imported water supply is sourced.

Data Sources

Santa Clara County's historical temperature and precipitation data from 1950 to 2019 was utilized to determine how these key indicators of climate have changed in Santa Clara County over time. These data were obtained from the National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information. Graphs produced by NOAA are included to show Santa Clara County's observed historical trends in temperature and precipitation. Statistical analyses were conducted to determine changes in county climate data[7].

Santa Clara County's projected climate change trends were determined using downscaled global climate model (GCM) projections from Cal-Adapt, a web-based climate adaptation planning tool (CEC, 2020). CalAdapt was developed by the Geospatial Innovation Facility at UC Berkeley with oversight from the California Energy Commission (CEC). The development of CalAdapt was a key recommendation of the 2009 California Climate Adaptation Strategy, which was one of California's early efforts at multidisciplinary climate planning. CalAdapt enables users to visualize trends and access high-quality, peer reviewed data related to climate change impacts (CalAdapt 2020).

This chapter includes CalAdapt graphs showing modeled projections of climate change indicators, such as temperature, precipitation, and other variables. The projections are based on four models that have been selected by California's Climate Action Team

[7] Regression lines were plotted in Excel to determine that the trends in this data are statistically significant, with p-values less than 0.05 being considered statistically significant. Graphs shown in the discussion are from NOAA and CalAdapt and do not show the regression lines.

Research Working Group as priority models for research. Each of these models reflects a distinct type of climate pattern and CalAdapt uses the average of these models to present projections that cover a range of possible climate conditions.

CalAdapt provides projections for two emissions scenarios:

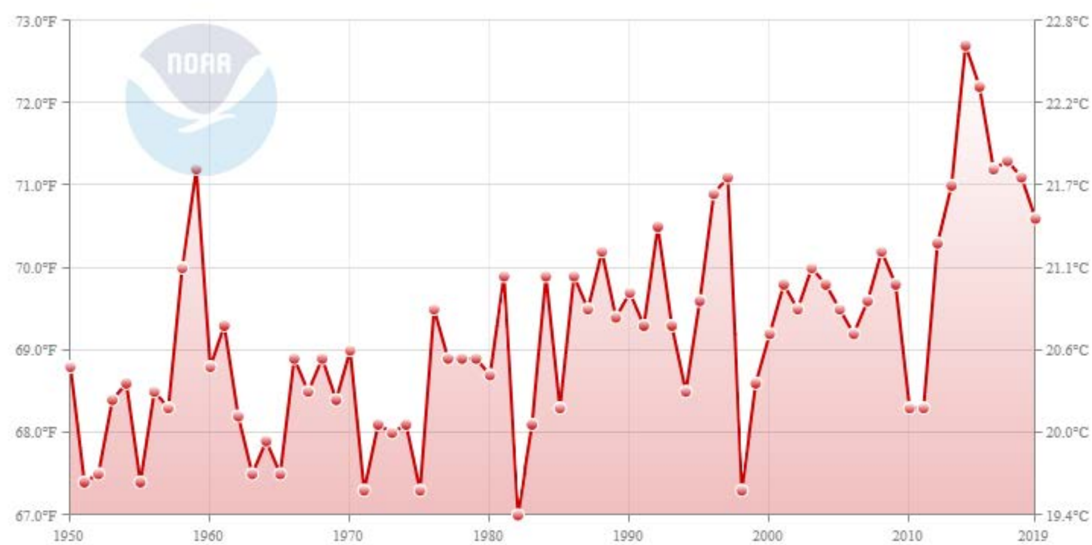
- Representative Concentration Pathway (RCP) 4.5, a stabilization scenario that assumes GHG emissions peak around 2040, then decline,
- RCP 8.5, a "business as usual" scenario in which emissions continue to rise strongly through 2050 and plateau at 2100.

The discussion of climate projections included in the following sections presents the projections for both emissions scenarios in order to show the range of possibilities for future climate. The figures show data for RCP 8.5. Valley Water is continually studying climate change science and is developing an approach for downscaled data and GCMs. Downscaling data enables the inference of local climate response from large-scale climate patterns, thus allowing for a more region-specific understanding of climate change impacts. CCAP implementation efforts will utilize this Valley Water specific approach when it is finalized.

Temperature

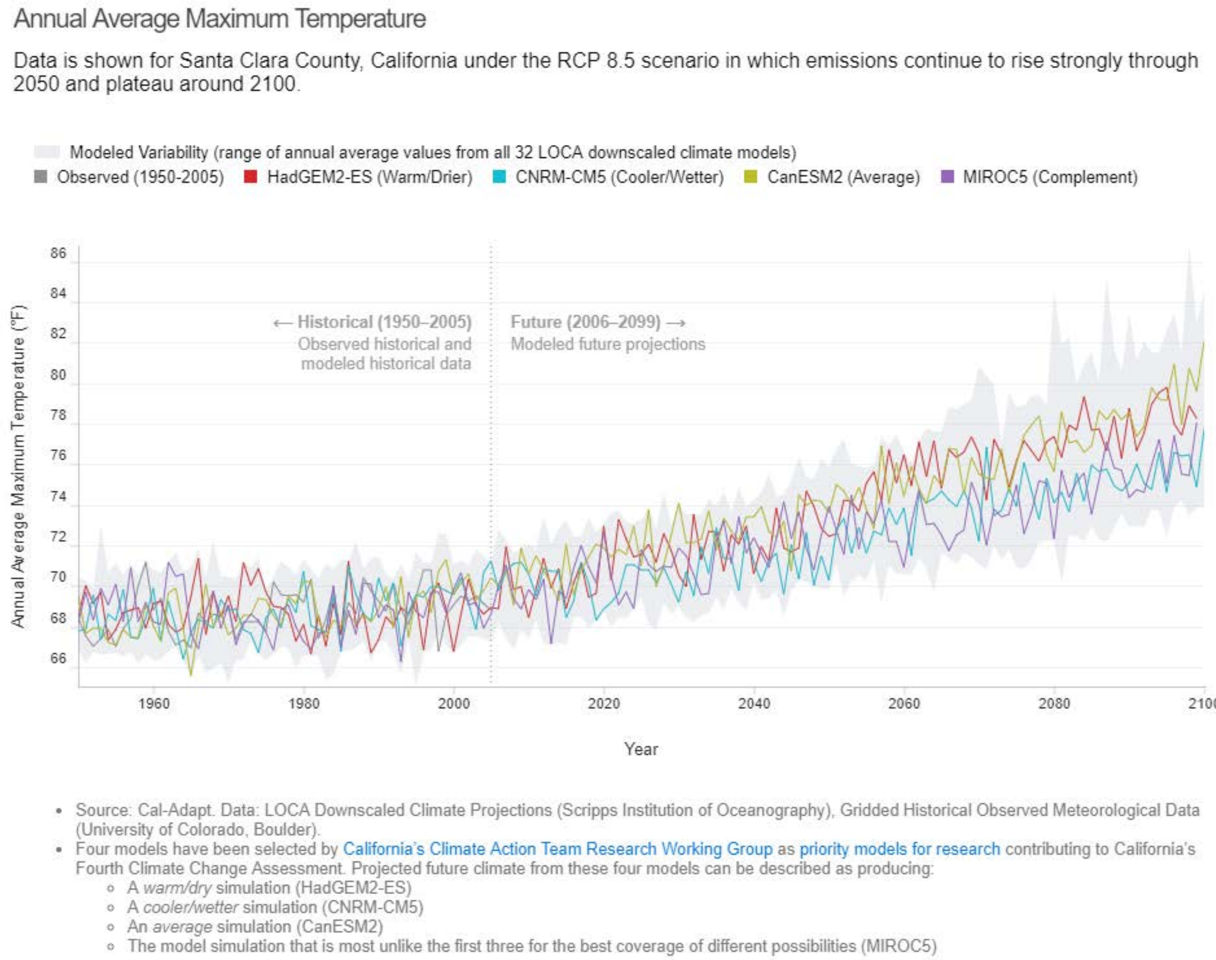
Between 1950 and 2019, an analysis of historical data shows that Santa Clara County's annual average maximum temperature has increased by 2.5˚F (Figure 2; NOAA 2020).

Figure 2: Santa Clara County's Observed Annual Average Maximum Temperature, 1950 to 2019



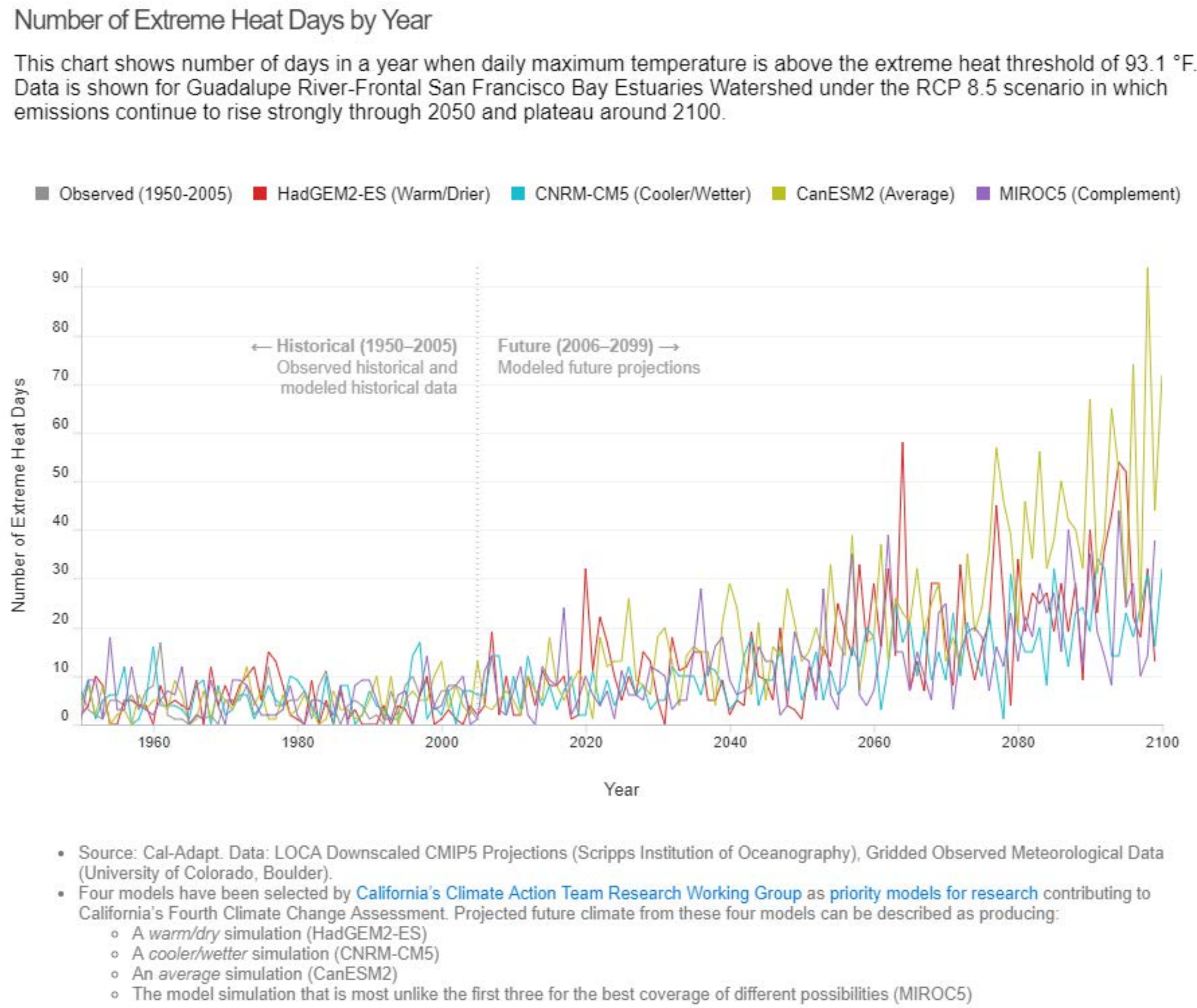
The County's annual average maximum temperature is projected to rise by 1.8˚F by 2050 and by an additional 0.6˚F by 2100 under RCP 4.5 (Figure 3; CEC, 2020). The annual average maximum temperature is projected to rise by 2.0˚F by 2050 and an additional 2.6˚F by 2100 under RCP 8.5 (Figure 3).

Figure 3: Santa Clara County's Projected Annual Average Maximum Temperature, 1950 to 2100



Increases are also expected in the number of extreme heat days, which are days when the daily maximum temperature is above the extreme heat threshold of 93.1°F. An average of model projections shows that the annual number of extreme heat days is projected to rise by 2.7 days per year by 2050 and by an additional 1.7 days per year by 2100 under RCP 4.5 (Figure 4; Cal-Adapt, 2020). Under RCP 8.5, the annual number of extreme heat days is projected to rise by 5.6 per year by 2050 and by an additional 4.4 days per year by 2100.

Figure 4: Santa Clara County's Projected Annual Number of Extreme Heat Days, 1950 to 2100



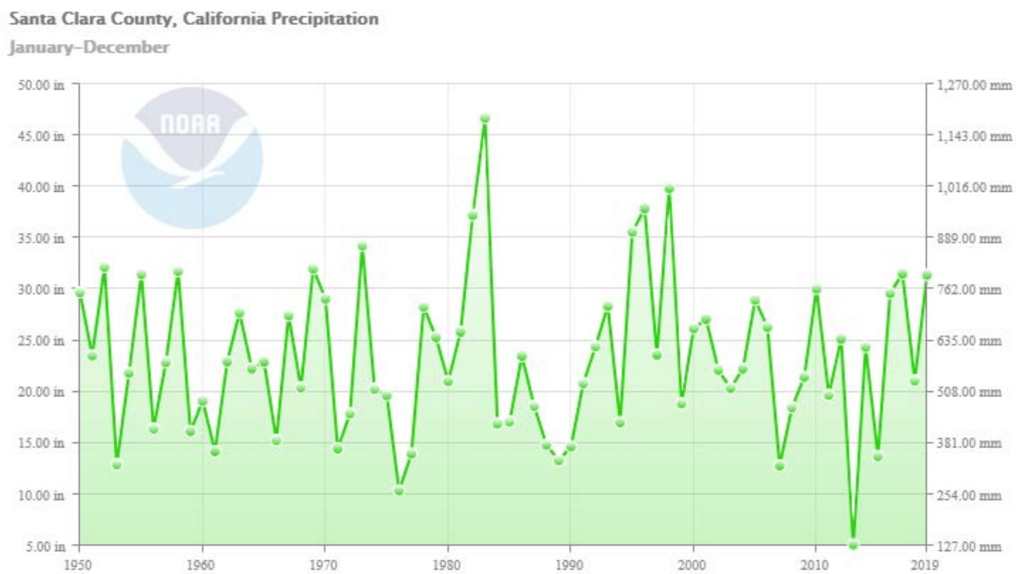
Precipitation

Projections show that precipitation in the San Francisco Bay Area will continue to exhibit high year-to-year variability with very wet and very dry years (Ackerly et al., 2018). Annual precipitation volume is projected to increase. Despite the increase in volume of precipitation, the wet season will be shortened, compressing the time during which the increased precipitation will fall (Swain et al., 2018). The San Francisco Bay Area's largest winter storms will likely become more intense and possibly more damaging. Statewide, modeling shows that there are likely to be "fewer wet days, wetter winters, drier springs and autumns, and an increase in dry years as well as maximum precipitation in a single day" (Pierce et al., 2018). Projections for the San Francisco Bay Area are generally consistent with this statement (Ackerly et al., 2018). Santa Clara County's projected precipitation trends reflect those for the San Francisco

Bay Area; overall, precipitation is likely to become more erratic as climate impacts occur.

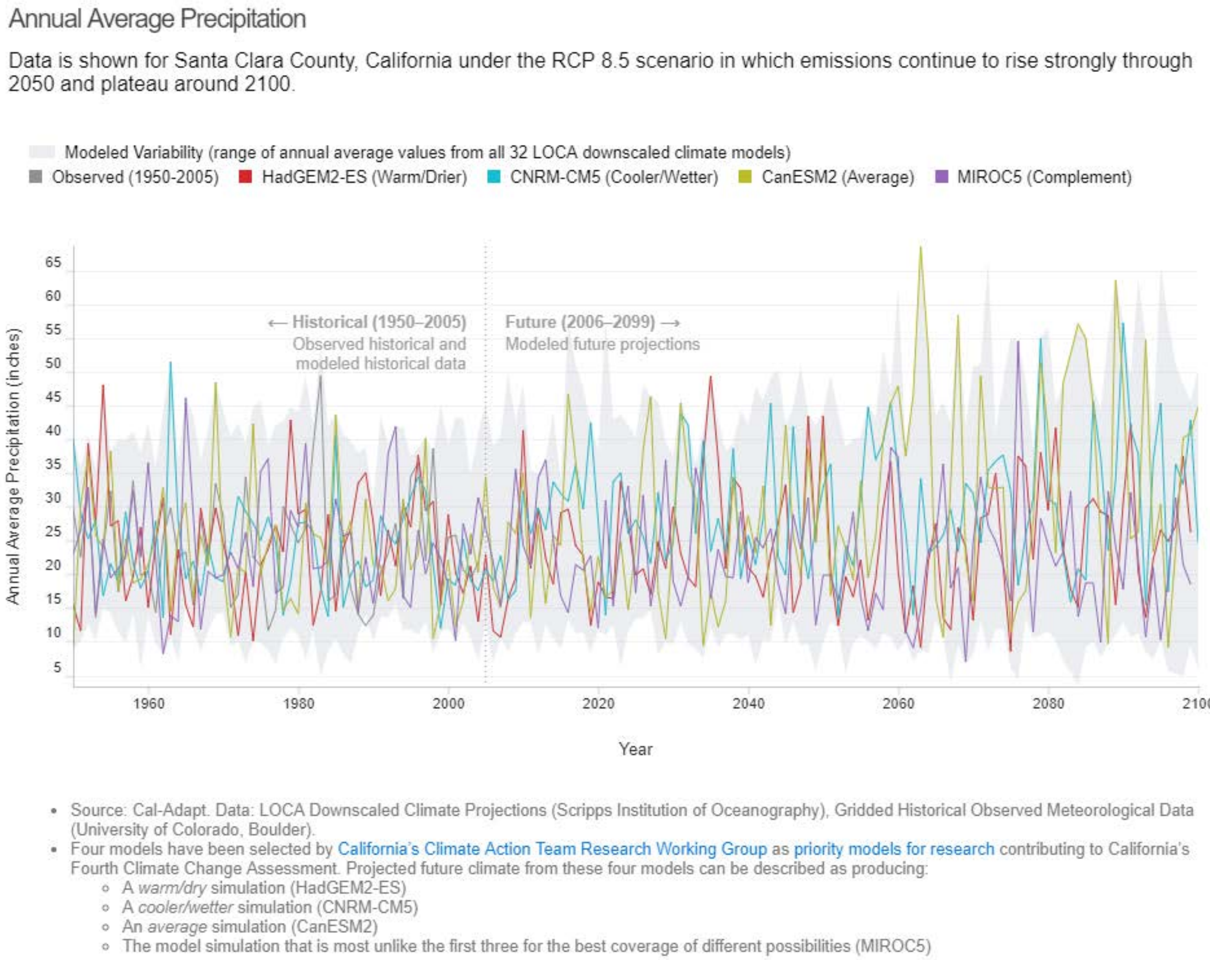
The average annual precipitation in Santa Clara County was 23.3 inches per year from 1950-2019 (Figure 5) and does not show a statistically significant change in average annual precipitation during that time (p = 0.84). An analysis of modeled precipitation shows that future changes in precipitation are significant, though marginally. The County’s annual precipitation is projected to rise by 0.5 inches by 2050 and by an additional 0.3 inches by 2100 under RCP 4.5. Under RCP 8.5, the annual average precipitation is projected to rise by 1.3 inches by 2050 and an additional 0.8 inches by 2100

Figure 5: Santa Clara County's Observed Annual Precipitation, 1950 to 2019



The average of model projections for Santa Clara County shows an average annual increase in precipitation of 4.1 inches by mid-century and an additional 0.4 inches by late-century under RCP 4.5. The average of model projections shows an increase of 4.1 inches by mid-century and an additional increase of 4.2 inches by late-century under RCP 8.5. Figure 6 depicts projected precipitation patterns for Santa Clara County under RCP 8.5. However, Valley Water should be prepared for all possibilities since the various models do not show a consistent trend in precipitation during the next century, with some models showing constant or opposing trends (CalAdapt 2020). In addition, even modest changes can have a significant impact as water supply systems and ecosystems are conditioned to historical precipitation levels (CEC 2020).

Figure 6: Santa Clara County's Projected Annual Average Precipitation, 1950 to 2100

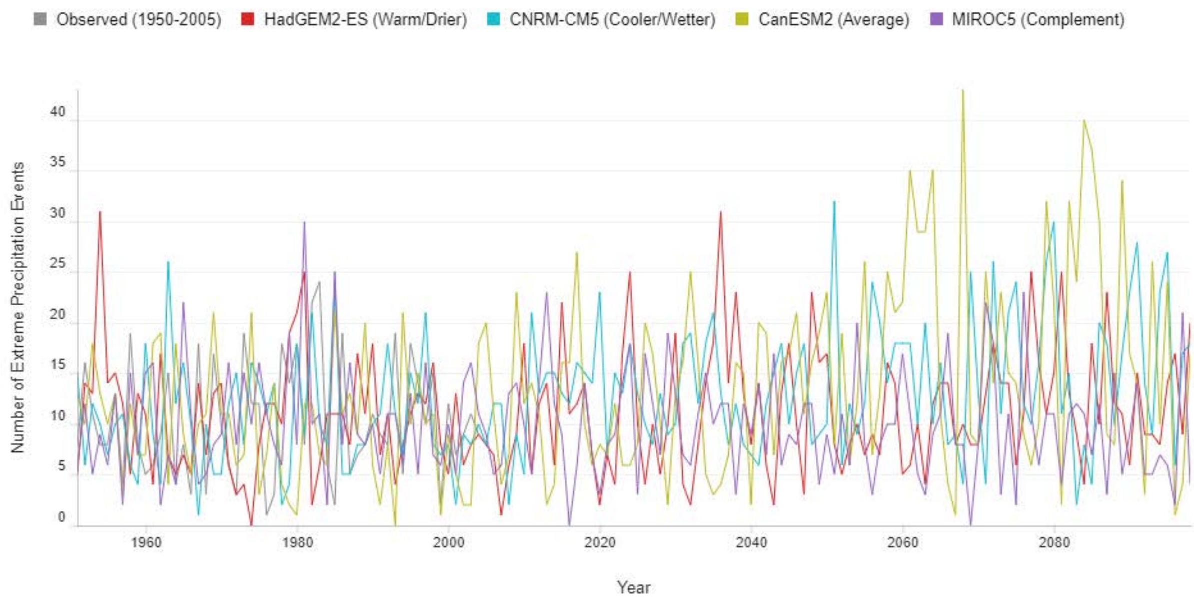


The average of model projections shows an average annual increase in extreme precipitation events of 0.7 events per year by mid-century under RCP 4.5, and 1.9 events under RCP 8.5. Following 2050, extreme precipitation events may increase by an additional 0.5 events per year under RCP 4.5 or by an additional 1.1 events per year under RCP 8.5 (shown in Figure 7). Figure 7 shows extreme precipitation events, or the number of days in a water year (Oct–Sep) with two-day rainfall totals above an extreme threshold of 2.94 inches. Data is shown for the Guadalupe River-Frontal San Francisco Bay Estuaries Watershed, which encompasses the central and northern portions of Santa Clara County.

Figure 7: Santa Clara County's Projected Annual Extreme Precipitation Events, 1950 to 2100

Number of Extreme Precipitation Events by Water Year

This chart shows number of days in a water year (Oct–Sep) with 2-day rainfall totals above an extreme threshold of 1 inches. Data is shown for Grid Cell (38.5937, -121.4687) under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.



- Source: Cal-Adapt. Data: LOCA Downscaled CMIP5 Projections (Scripps Institution of Oceanography), Gridded Observed Meteorological Data (University of Colorado, Boulder).
- Four models have been selected by California's Climate Action Team Research Working Group as priority models for research contributing to California's Fourth Climate Change Assessment. Projected future climate from these four models can be described as producing:
  - A *warm/dry* simulation (HadGEM2-ES)
  - A *cooler/wetter* simulation (CNRM-CM5)
  - An *average* simulation (CanESM2)
  - The model simulation that is most unlike the first three for the best coverage of different possibilities (MIROC5)

Drought and Snowpack

Drought severity and duration could be affected by both temperature and precipitation patterns. Projected future increases in temperature, regardless of whether total volume of precipitation goes up or down, will likely cause droughts of greater severity and duration (Ackerly et al., 2018). It is notable that mega-droughts spanning multiple decades have occurred in California's past, according to paleoclimatic records (Ackerly et al., 2018). The 2012-2016 California drought was likely the most severe drought in the last 1,200 years and led to a 500-year low in Sierra snowpack (Ackerly et al., 2018).


Coyote percolation pond experiencing severe drought in 2019.

Snowpack is already in decline, partially due to rising temperatures causing the historical location of the freezing line in mountains to move upslope, earlier melting, and shorter seasons of snowfall (Ackerly et al., 2018). The record low snowpack during the recent 2012-2016 drought was a major factor in the statewide economic loss of $2.1 billion, led to 21,000 jobs lost in California's agricultural and recreational sectors, and caused groundwater depletion throughout the drought (Ackerly et al., 2018).

An analysis of models projecting future snowpack in the Western United States shows that Sierra Nevada snowpack may decline by 30 to 60% by 2040-2065 under RCP 8.5 (Rhoades et al., 2018). A study conducted by the UCLA Center for Climate Science predicted an average 64% drop in springtime snowpack volume by the end of the century, assuming a business as usual emissions scenario (comparable to RCP 8.5) (Reich et al., 2018).

Wildfire

In addition to diminishing snowpack, shifting temperature and precipitation patterns are likely to alter historical patterns of wildfire. CalAdapt models Santa Clara County's past and projected annual area burned by wildfire (CEC 2020). From the present to 2050, the average of these models shows an increase in Santa Clara County's burn area under RCP 4.5 by 79.6 hectares, or 3%. Under RCP 8.5, the modeled data shows a statistically significant but small increase in Santa Clara County's burn area —an increase of approximately 50.6 hectares, or 1.9% percent by 2050. By 2100, these models show an increase in an additional 48.7 hectares to the burn area or an additional 1.6% under RCP 4.5, and an additional 31.1 hectares or 1.1% increase to the burn area. The four models selected as CalAdapt's most representative set of models do not show consistent trends in wildfire for Santa Clara County. From 2050 to 2100, uncertainty in urbanization and population growth rates make it difficult to forecast wildfire patterns.

The projected change in the area burned by wildfire is due to the combination of warming temperatures and the spread of development into the wildland-urban interface (CEC 2020). Increased fire probability is projected in most of the San Francisco Bay Area, especially the dry hills around Mt. Hamilton, with reduced fire risk near urban areas and development corridors (Ackerly et al., 2018). In the San Francisco Bay Area, there are more consistent projections of increased fire activity (i.e., more frequent or greater area burned), due to a warmer climate (Ackerly et al., 2018). In urbanized regions, fire risk is unequal; areas that are highly urbanized have lower wildfire risk than areas in the wildland-urban interface (Ackerly et al., 2018). As urban development spreads further into the wildland-urban interface, fire risk could potentially increase in these areas (Ackerly et al., 2018). This trend is true for Santa Clara County as well as for the Bay Area as a whole. Increased fire risk could result in increased fire severity and frequency.

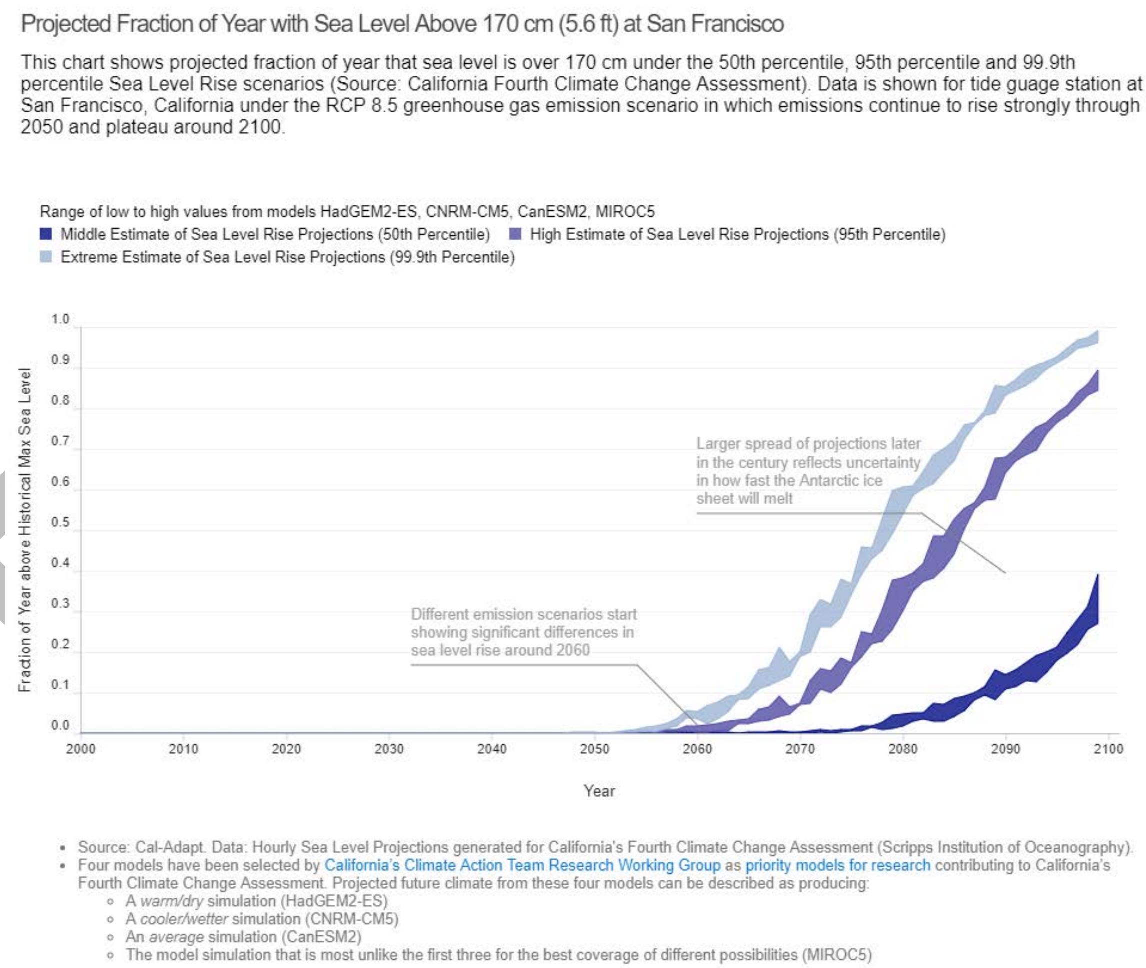
Sea Level Rise (SLR)

Sea level in the San Francisco Bay Area, including Santa Clara County, has risen nearly eight inches in the last 100 years and continues to rise. This increases the risk of coastal flooding and saltwater intrusion into aquifers, and habitat loss in near-shore environments. Each of the tidal gauges in the San Francisco Bay shows an acceleration in SLR since 2011 (Ackerly et al., 2018).

The California Oceans Protection Council (OPC) assembled a working group to put together projections of SLR in California for use in regulatory and planning activities (CA OPC 2017). This working group produced a guidance document that was first published in 2010 and has since been updated in 2013 and 2017. SLR projections from the 2017 document are consistent under various emission scenarios (including RCP 4.5 and RCP 8.5) by 2050, with disparity between emissions scenarios appearing later in the century. By 2050, the OPC projects SLR of 0.9 feet above the 1991-2009 mean sea level at the San Francisco tidal gauge. Under RCP 4.5, a rise of between 1.2 and 2.7 feet is projected. Under RCP 8.5, a rise between 1.6 and 3.4 feet is projected. These projections may underestimate the possibility of extensive loss from Antarctic ice sheets. In an extreme scenario, the OPC projects that the San Francisco tidal gauge could see SLR of ten feet . Due to unpredictability in the melting of Antarctic ice sheets, the OPC recommends making planning decisions using the more likely ranges of SLR included above.

SLR is not the only coastal hazard that may result from climate change. As precipitation patterns shift, coastal areas may experience seasonally elevated sea levels as a result of severe storms or king tides, which combined with background SLR may result in increased coastal flooding (CA OPC 2017). Figure 8 shows the projected fraction of each calendar year (2000-2100) with sea level above the historical average sea level at the San Francisco tidal gauge. This figure includes projections for three distinct SLR scenarios under RCP 8.5. The three SLR scenarios represent a middle estimate of SLR (50th percentile), high estimate of SLR (95th percentile), and extreme estimate of SLR (99th percentile). The graph shows that by approximately 2060, sea level is projected to be above the historical mean sea level for a larger percentage of the year under all of the SLR scenarios shown.

Figure 8: Projected Sea Level Rise, 2000-2100



2.2. Climate Change Impacts on Valley Water Mission Areas

Water Supply

Droughts have been identified as a major threat to water supply reliability and are expected to increase in frequency due to climate change. Both local and imported sources of water may be impacted. The reliability of imported water from the Sacramento-San Joaquin River Delta watershed, which makes up about 40% of Valley Water's annual water supply, faces the threats of decreased availability due to decreasing snowpack, changing precipitation patterns, and increased salinity due to SLR. Imported water is crucial for Valley Water's ability to recharge groundwater basins and maintain a resilient surface water supply. Valley Water's imported water supply is highly dependent on snowpack and the historical patterns of annual snowmelt, which are projected to be affected by climate change. Conflicts may arise as a result from reduced water supplies.

A vulnerability assessment conducted for the Department of Water Resources identified that sources of imported water will be particularly vulnerable to shifting hydrologic patterns (DWR 2019). In a study conducted as a part of California's Fourth Climate Change Assessment, the SWP and CVP were both projected to face challenges in meeting export demands because of climate change impacts (Wang et al., 2018).

Locally, reservoir storage is susceptible to precipitation and temperature changes, which can lead to increased algal blooms, including both algal blooms affecting the taste and odor of water and harmful algal blooms (HABs) that create toxins[8]. Temperature changes may also lead to high evaporative losses. Wildfire may also threaten the water quality and capacity of reservoirs due to increased sediment discharge.

SLR threatens water supply assets, such as the Silicon Valley Advanced Water Purification Center (SVAWPC). With 1.41 meters (4.6 feet) of SLR, the SVAWPC could be affected by up to a meter of flooding during a one-in-100 year storm event (CalAdapt 2020) without infrastructure improvements. SLR could also exacerbate saltwater intrusion to shallow groundwater from tidal creeks near the San Francisco Bay.

Floods

Floods may become more likely as a result of increasing precipitation intensity, extreme storm events, and SLR (Ackerly et al., 2018). Flood types that may impact Santa Clara County include flash floods (i.e. rapid flooding on ground with poor absorption ability)

[8] For the remainder of this document, "algal blooms" refers to both types of algal blooms discussed here.

and urban flooding due to drainage problems in urban areas. Areas burned by wildfire may be susceptible to increased runoff rates, increasing flood potential. River and coastal floods are also possible and are described in further detail below.

Urban flooding due to insufficient drainage and increased precipitation intensity, extreme storm events, and sea level may increase with climate change.

River Flooding

River flooding, also called fluvial or riverine flooding, occurs when rainfall intensity or frequency causes a river to exceed its capacity. Climate change will affect the level of river flood risk since existing flood protection projects have been designed considering statistical analysis of past events and are built to provide protection to a certain level—often the one percent flood (1 in 100 chance or 1% probability) of being equaled or exceeded in any given year. Climate change impacts on the frequency and severity of fluvial flooding are difficult to predict with certainty. Most models project more intense storms, and possibly increased return frequencies. Using IPCC data, Ackerly et al. (2018) projected that a 20-year return frequency one-day storm event for the Bay Area would increase in frequency by a factor of three or more by end of century, becoming a once-in-seven year storm rather than a once-in 20 year storm. The level of protection provided by previously built flood protection infrastructure may be insufficient if hydrologic conditions vary from design assumptions, as a result of climate change.

Furthermore, the predicted increase in frequency of droughts will contribute to riverine flooding. Drought conditions cause soil to become less absorptive, increasing watershed runoff, vegetation dieback, and associated wildfire risk. Wildfires could further decrease soil absorption through erosion or leave debris that forms an impermeable layer. In either event, this may result in greater possibility of floods following an intense precipitation event. More intense storms can increase debris and tree blockages in flood conveyance facilities and streams, which increases the vulnerability of existing flood projects. In addition, flooding can impact riparian habitat, nearby infrastructure, businesses and homes.

Coastal Flooding

As sea levels continue to rise, so will vulnerabilities that are associated with tidal flooding. Rising sea levels can permanently inundate some areas and exacerbate other flood risks. In addition, more intense storms and storm surge will increase tidal or shoreline flooding vulnerabilities. As sea level rises, daily tidal fluctuations could result in frequent inundation of low-lying areas, specifically in periods of elevated tides (such as king tides) (Ackerly et al., 2018). The impacts associated with tidal flooding are much the same as with riverine flooding and include potential impacts to tidal habitats, nearby infrastructure, businesses and homes. Many of the Bay Area's wastewater treatment plants are in close proximity to the Bay's shoreline, including Santa Clara County's Palo Alto Regional Water Quality Control Plant, the Sunnyvale Water Pollution Control Plant, and the San Jose-Santa Clara Regional Wastewater Treatment Facility.

In addition, tidal flooding increases salinity intrusion into the Delta, impacting the amount of water supply available for importation. The SWP and CVP are responsible for maintaining salinity levels within the Delta, under the Bay-Delta Water Quality Control Plan. With future tidal flooding, the water projects will need to release more freshwater in the Delta to maintain compliance with salinity objectives. One analysis determined that SLR alone could cause a 2% decrease in annual Delta exports by mid-century (projected one foot SLR) and a 9% decrease in annual Delta exports by the end of the century (projected two feet SLR) for this reason (Wang et al., 2011).

SLR Driven Groundwater Emergence

Another flood-related risk that could be intensified due to climate change is SLR-driven groundwater emergence. This is a phenomenon that occurs when SLR causes shallow groundwater in coastal areas to rise above the surface. In developed areas, groundwater emergence can damage infrastructure and property, creating unforeseen challenges within Valley Water's mission area of providing flood protection (Hoover et al., 2017).

Ecosystems

Local ecosystems, which sustain life and provide numerous economic and ecological functions and values, may degrade in response to the Bay Area's changing climate. A report prepared to summarize the ecological condition of streams in Santa Clara County based on Valley Water's assessment of individual watersheds identified changing precipitation and evaporation patterns as the climate impacts most likely to threaten stream conditions. As stated in this report, "changes in these processes can have major effects on the hydrologic cycle and therefore, influence all ecosystem goods and services" (Lowe et al., 2020). When combined with the County's extensive urban development, climate change threatens biodiversity by leaving species with limited room to migrate. Climate change may also result in conditions that make terrestrial and aquatic ecosystems prone to invasive species growth (Ackerly et al., 2018).

Drier soils caused by rising temperatures and changing precipitation patterns may impact the ability of plant species to survive in their native habitats. Riverine ecosystems may experience decreasing populations of aquatic plant and animal species as rising temperature increases evapotranspiration and changing precipitation patterns lead to extended dry periods. Moyle et al. (2013) predicted that most native fish in California are highly vulnerable to climate change effects and are likely to suffer population declines and become more restricted in their distributions. Flooding resulting from changing precipitation patterns may impact terrestrial and aquatic ecosystems by increasing erosion (Ackerly et al., 2018). Similarly, more intense storms can increase channel incision and scour, reducing water availability to habitats, and exposing soil to erosion.

Wildfires may threaten plant and animal species, especially in forested areas (Ackerly et al., 2018). They also threaten the water quality of creeks and reservoirs, leading to detrimental impacts on aquatic life. Burned areas may also reduce the area available for use in mitigation planting and restoration. Species living in tidal wetlands may be impacted by inundation from SLR, especially given the lack of adjacent upland vegetated areas of these ecosystems for these species to migrate. Transitional or ecotone habitats along San Francisco Bay's tidal wetlands and waters are mostly developed, or have levees preventing upslope migration of wetland flora and fauna in response to rising sea levels.

2.3. Discussion

The climate change impacts to Valley Water's mission areas described above are anticipated to affect Santa Clara County and, more broadly, the entire San Francisco Bay Area in the coming years and decades. Changing temperatures and precipitation patterns are likely to alter hydrologic patterns, including extreme weather events, floods, droughts, and wildfires. Santa Clara County's temperature is projected to rise by 1.6-2.2˚F by 2050 under RCP 4.5 or by 1.5-2.7˚F by 2050 under RCP 8.5, and extreme heat days are expected to increase in frequency. Precipitation may increase in overall volume and extreme precipitation events may increase in frequency. Shifting temperature and precipitation patterns may have the secondary effects of more frequent and severe droughts, increased risk of wildfire, and SLR. Snowpack in the state is also expected to decline.

These effects will have impacts on local and imported water supply availability. Thus, Valley Water may be affected by these local and regional climate impacts in many areas of agency operations. As indicated by Board Ends Policies E-2, E-3, and E-4, it is crucial that Valley Water address these climate impacts to remain prepared to provide water resource services in present and future conditions.

In 2012, California became the first state in the nation to recognize the human right to water in its legislation, with the addition to California's water code that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes" (Water Code 2012). The human right to water remains regardless of climate change. Climate change impacts have been shown to disproportionately impact disadvantaged populations, which is an environmental justice concern (Morello-Frosch 2009). Valley Water recognizes that certain populations are likely to be more vulnerable than others to the climate change impacts discussed in this chapter. Valley Water has existing planning efforts that include considerations for communities that have been identified as disadvantaged, including the Integrated Water Resources Master Plan, the One Water Plan, and the stormwater resource plans.[9]

In order to be prepared for potential climate change impacts on the ability of Valley Water to provide clean water, flood protection, and ecosystem stewardship, this CCAP assesses the agency's specific climate vulnerabilities and develops mitigation and adaptation goals and strategies to address these vulnerabilities and ensure future resilience. Chapter 3 discusses Valley Water's vulnerabilities to climate change and the risk level associated with these vulnerabilities. Chapter 4 presents goals, strategies, and suggest possible actions that will guide Valley Water in building climate change considerations into its everyday operations.

[9] The DWR defines disadvantaged communities as communities in which the median household income is less than 80% of the statewide average.

Chapter 3: Vulnerability and Risk Assessment

It is necessary to have a clear understanding of Valley Water's climate-related vulnerabilities and their associated risks in order to form strategies that improve the agency's resilience. In the context of this CCAP, a vulnerability is defined as a characteristic of a natural resource, function, system, or asset that makes it susceptible to the damaging effects of a hazard such as climate change. Risk is defined as the potential impact of a given vulnerability over a specified future period. Risk is determined based on measurements of a given vulnerability's likelihood and potential severity. A detailed assessment was conducted to identify these vulnerabilities and estimate their level of risk to Valley Water. The methods of vulnerability and risk assessment used are consistent with the Water Resource Foundation's Water Utility Business Risk and Opportunity Framework, which is intended to provide water utility agencies with guidance on how to identify and plan for climate change impacts (Wasley 2020). This CCAP's vulnerability and risk assessment had two major objectives—first, to identify vulnerable areas of Valley Water's operations and, second, to determine perceived risk to these vulnerable areas. This chapter will describe the methodology and results of the vulnerability and risk assessment.

As discussed in Chapter 2, the unpredictability of climate change impacts means that efforts at climate resilience need to consider a range of possible outcomes. The risk levels associated with these vulnerabilities are reflective of their perceived threat to agency operations. To this effect, the vulnerability and risk assessment results described in this chapter are not intended to be concrete measurements of future impacts. Rather, they are intended to provide direction for the development of climate-responsive actions that will be finalized based on more individualized analyses of vulnerability and risk. Although this risk assessment is framed as an assessment of future risk associated with climate change, Valley Water recognizes that climate change is already magnifying natural disasters, such drought, flooding and wildfire.

3.1. Methodology

3.1.1. Vulnerability Identification

From October 2017 to December 2017, CCAP project staff conducted approximately 80 interviews with the managers of all internal workgroups to gather baseline data about perceived climate change impacts. In each interview, participants reviewed a sample list of general climate change vulnerabilities that could potentially impact Valley Water's operations. This sample list was based on a literature review of external vulnerability checklists (CA DDW 2017; Valley Water 2015; U.S. EPA 2011).

Managers were then asked to develop a list of resources, operations, or assets with potential climate change vulnerabilities. Next, over 30 unit-level vulnerability workshops were conducted to refine and clarify the vulnerabilities identified in the first round of interviews. The results of these interviews were compiled into a list of agency-specific climate vulnerabilities. While this process aimed to be as comprehensive as possible, there may be other vulnerabilities affecting operations that are currently unidentified or unforeseen.

Ultimately, 49 vulnerabilities were identified and compiled into a checklist for use during the risk assessment process. The vulnerabilities were further consolidated into categories that align specifically with Valley Water's three mission areas (Water Supply Vulnerabilities, Flood Protection Vulnerabilities, Ecosystem Stewardship Vulnerabilities), as well as a fourth category for emergency preparedness (Emergency Preparedness Vulnerabilities). Asset and finance-related vulnerabilities were also addressed within these four categories.

3.1.2. Risk Assessment

The second step of the vulnerability and risk assessment process was to establish a consistent rating system to be used for determining each vulnerability's risk level in two time frames— 2020 to mid-century (2050) and 2050 to late-century (2100). The methodology for this risk rating system was developed based on a literature review of six public agencies' risk assessment guidance documents (CA EMA 2012; U.S. EPA 2012, U.S. EPA 2014; US DOT, 2017; CA Governor's OPR 2017; U.S. EPA (Region 9) 2011), three internal risk assessment frameworks (SCVWD 2016; SCVWD 2017; SCVWD 2019), a report on agency practices, and other agencies' climate action plans to assess their methods for risk assessment. The literature review also considered international risk assessment approaches by the IPCC and International Standards Organization (ISO) in order to guide appropriate and consistent use of definitions and concepts (Cardona et al., 2012).

Based on the literature review, a scoring system was developed to enable staff workgroups to assign each vulnerability an appropriate level of perceived risk. The final risk rating system considered likelihood and consequence of each vulnerability. Likelihood is defined as how likely the vulnerability would be to manifest in climate impacts for one or more parts of the agency. Consequence is defined as how severe an impact is likely to be, if realized. In this risk rating system, a vulnerability's overall level of risk was determined by its relative likelihood and consequence scores, on scales of 1 to 4. Risk ratings were assigned for each vulnerability based on their scores in likelihood and vulnerability, as shown in Table 4.

Table 4: Risk Rating Matrix

Likelihood	Risk Rating			
Almost Certain (4)	Low	Medium	High	Extreme
Likely (3)	Low	Medium	High	Very High to Extreme
Possible (2)	Low	Medium	Medium	Medium
Unlikely (1)	Low	Low	Low	Low
Consequence	Minor (1)	Moderate (2)	Major (3)	Catastrophic (4)

The vulnerability checklist, risk rating system, and summaries of possible climate change impacts were distributed to fifteen staff workgroups representing Valley Water's mission areas and objectives. Each workgroup consisted of three to five staff with subject-matter expertise as well as an overall understanding of the agency's mission and objectives. These workgroups were tasked with scoring each vulnerability for likelihood and consequence in six categories (water reliability and quality, flooding, watershed stewardship, asset management, fiscal sustainability, and emergency response). Through the risk assessment, some vulnerabilities were scored as presenting risk to more than one category. In these instances, the relative scores can differ between categories. For example, a vulnerability may be of medium risk to flooding at mid-century but of high risk to ecosystems at mid-century.

3.1.3. Peer Review

The methodology was reviewed by an internal panel of Valley Water staff and by an external panel of subject-matter experts. The external peer-review panel consisted of Ed Maurer, PhD, Professor of Civil, Environmental, and Sustainable Engineering at Santa Clara University; Newsha K. Ajami, PhD, Senior Research Engineer at Stanford University's Woods Institute; and Julia Ekstrom, PhD, Senior Environmental Specialist at the California Department of Water Resources.

3.2. Summary of Results

Risk assessment results are shown in tables for vulnerabilities related to water supply, flood protection, and ecosystem stewardship. A discussion of the risks is presented below each table, as they pertain to specific topics. The discussion does not necessarily emphasize risk at the perceived levels as determined in the study. Vulnerabilities identified as low risk may receive substantial discussion as they still pose significant risk to particular operational areas.

3.2.1. Water Supply Vulnerabilities

The risk assessment results presented in Table 5 show that several aspects of providing a safe, clean, and reliable water supply may be vulnerable to climate change. Climate change poses risks to operational flexibility in a number of areas, including water availability, demand, water quality, supply-related assets and infrastructure, and agency operations.

Table 5: Water supply vulnerabilities with associated level of assessed risk

Vulnerability	Mid Century Risk	Late Century Risk
Drought	High	Extreme
Reduced or altered local or imported water volume	High	Extreme
Reduced imported water quality	High	High
Stress on water supply assets	High	High
Disruption to supply chain	Medium	High
Drinking water quality	Medium	High
Extreme storm damage to assets	Medium	High
Flood impacts to assets	Medium	High
Groundwater replenishment following drought	Medium	High
Wildfire impact to water quality	Medium	High
Ability to fund Valley Water operations	Medium	Medium
Availability of regional partners or contractors	Medium	Medium
Changes to regulations	Medium	Medium
Disruption of power supply	Medium	Medium
Extreme heat impact on physical assets	Medium	Medium
Groundwater depletion or overdraft	Medium	Medium
Invasive species management	Medium	Medium
Operational flexibility	Medium	Medium
Physical access to facilities and project sites	Medium	Medium
Recycled water quality or volume	Medium	Medium
Sedimentation impact to water supply facilities	Medium	Medium
Water quality or quantity stressors to aquatic life	Medium	Medium
Heat stress to staff or contractors	Low	Low

Vulnerability	Mid Century Risk	Late Century Risk
Increased water demand	Low	Low
Salt-water intrusion into drinking water aquifers	Low	Low

Surface Water Availability

The availability of local and imported surface water may be vulnerable to changes in precipitation patterns, as well as rising temperatures, which increases evaporation from surface waters and evapotranspiration that reduces infiltration and natural recharge to the local aquifers. Local and imported water availability may also be impacted by droughts, which may become more frequent and severe. Future droughts have been identified as Valley Water's primary water supply challenge, as water supplies may be insufficient to meet Valley Water's level of service goal[10] in the future, according to the agency's Water Supply Master Plan 2040. If a drought results in a reduction in surface water sources such that Valley Water has to reduce its treated water deliveries, groundwater may be more relied upon to meet demands, which may result in groundwater depletion and overdraft. This can impact both the immediate availability and longer-term sustainability of local groundwater supplies. Groundwater depletion or overdraft during an extended drought may cause land subsidence, which threatens infrastructure and property and may be irreversible. Recycled water may also be vulnerable to drought, as conservation efforts and overall reduction in available local and imported supplies for treatment plant delivery during droughts typically reduce the amount of wastewater available for recycling. Climate change may reduce surface water available for sensitive species in riparian habitats, which could trigger more stringent regulation of flows and reduce surface water supplies that Valley Water draws from. This could impact both local and imported water reliability. In addition, sedimentation resulting from extreme weather events and/or wildfires can impact the storage capabilities of reservoirs and reduce managed recharge of groundwater.

Local Stormwater Capture

Shifts in the timing and intensity of rainfall and runoff could affect the ability to capture and use local surface water supplies. It is more difficult to capture rainfall when it comes in a few intense storms because reservoirs are more likely to fill and spill, or releases are needed to make room for the storm flows. During rainy

[10] The Valley Water Board approved an updated long-term water supply reliability level of service goal on January 14, 2019. The goal is to develop supplies to meet at least 100 percent of annual water demand identified in the Valley Water's Master Plan during non-drought years and at least 80 percent of annual water demand in drought years.

periods, demand for water is typically lower, so the storm flows are difficult to put to immediate use. Thus, even if the volume of average annual rainfall stays the same, the ability to use local supplies may decrease if it comes in fewer but more intense storms.

Imported Water Availability

Imported water may be less reliable due to decreasing snowpack in the Sierra Nevada and Cascade mountain ranges. More than half of the Sierra Nevada snowpack may be lost by the end of the century (Reich et al., 2018). Snowpack may dwindle or nearly disappear during droughts (Berg & Hall, 2017). Additionally, seasonal shifts associated with climate change may cause snow to melt earlier in the season, which can be particularly problematic for imported water supply. Runoff from early snowmelt is not as easily conserved in reservoirs and is therefore unable to be used to meet summer demand (Wang et al., 2018). The availability of water from the Sacramento-San Joaquin Delta watershed (via the SWP and the CVP) and from Hetch Hetchy Reservoir (via the San Francisco Public Utilities Commission) is dependent on snowpack.

More precipitation falling as rain and earlier snowmelt may exceed the storage capabilities of the existing SWP and CVP reservoirs, which may lead to reduced water supply allocations. Increasing drought frequency or intensity would also decrease imported water allocations. In addition to reducing Valley Water's CVP and SWP contract allocations, the factors mentioned above would likely reduce the amount of water supplies available on the transfer market, which Valley Water uses to offset water shortages in dry years. During droughts, poor water quality in the Sacramento-San Joaquin Delta results in significant losses in transferred water supplies, as well as reduced pumping to avoid exceeding water quality criteria.

In addition to the declining snowpack, imported water availability may be impacted by rising sea levels, as saltwater intrusion changes the amount of water available for export through the Sacramento-San Joaquin Delta watershed. SLR will also put additional pressure on fragile Delta levees, making them more susceptible to failure.

The higher end of SLR projections would result in transformative impacts to both the Delta ecosystem and imported water supplies.Under high SLR conditions, the balance between maintaining cold water pools in upstream reservoirs to support salmonid habitat conflicts with the need to release water from reservoirs to control salinity in the Delta to meet water quality criteria and supply water to businesses and communities. Water quality, flow, and export regulations would be impacted by these changes.

Water Demand

Although an increase in water demand was ranked with a low risk in comparison to others assessed, regional water demand may change substantially in coming decades. As such, it is an important factor to consider when assessing climate vulnerability and risk. Climate change may affect water demand in Santa Clara County. As temperatures increase, plant evapotranspiration may also increase and both agricultural and household landscapes may require a higher volume of water for irrigation. A higher agricultural water demand will likely drive additional groundwater pumping, particularly in South County. In addition, several facilities, such as energy plants, data centers, and cooling towers are located in the county. Higher temperatures may increase demands by these users.

Climate change will create water quality vulnerabilities in both local and imported sources. As water temperatures increase, surface water supplies become more vulnerable to the growth of algal blooms, the spread of invasive species, and increased evapotranspiration. Extreme storms and wildfires alter regional runoff patterns, dispersing greater volumes of sediment, nutrients, and other contaminants throughout the watershed. Changing runoff patterns may intensify sedimentation into reservoirs and increase their turbidity. This may lead to problems in conveyance equipment and filtration systems that are not designed to handle increased sediment loads. Detrimental water quality vulnerabilities have the potential to affect human health, fisheries, make Valley Water's compliance with water quality regulations more costly, and impact Valley Water's ability to meet its level of service goal. Additionally, impacts to water quality may limit the use of some surface water supplies for managed recharge facilities or result in the need for additional treatment prior to recharge. By threatening the viability of supplies, compounding effects associated with these threats could magnify the anticipated challenge of growing water demands.

Asset Management

Climate impacts place important water supply assets such as infrastructure and equipment under increased stress and can alter their ability to function properly. Examples include malfunction of oxygenation systems in reservoirs due to extreme heat events, power shutoffs due to wildfire risk affecting water supply equipment or power supply, damage to pumping systems or critical equipment by floods, or disruption to water supply infrastructure by landslides from extreme storms.

Baseline Conditions

Changing baseline conditions and the increasing frequency of weather emergencies can be detrimental to Valley Water's operations in several ways. These risks include disruption to the agency's supply chain; threats to power availability; and compromised access to equipment, facilities, and project sites for Valley Water staff, contractors, and stakeholders. The capability of staff, particularly field staff, will be impacted by extreme weather events, which can cause heat stress and exhaustion.

Regulatory Change and Financial Impacts

Increased risks to ecosystems resulting from climate change may lead to additional regulatory constraints. An altered regulatory environment could impact Valley Water's ability to meet its commitments associated with implementing water supply projects by increasing costs or causing delays. Increased risks to ecosystems resulting from climate change may lead to additional regulatory constraints on both local and imported water operations. Such changes may lead to an increased need for coordination with regulatory agencies and reduced water supplies.

Changing environmental conditions may increase a variety of expenses associated with new capital projects. The risk associated with climate change could increase project costs. Potential sources of additional expenses from climate change include construction delays, increased mitigation costs, or additional regulatory requirements.

Climate change can accelerate the deterioration of existing infrastructure, leading to increased operations and maintenance costs for completed projects.

3.2.2. Flood Protection

Climate change impacts such as increased storm frequency and SLR are likely to affect Valley Water's ability to provide flood protection. The flood protection vulnerabilities identified in the vulnerability and risk assessment are described in Table 6.

Table 6: Flood protection vulnerabilities with associated level of assessed risk

Vulnerability	Mid Century Risk	Late Century Risk
Ability to fund Valley Water operations	High	High
Availability of regional partners or contractors	Medium	High
Coastal assets (including infrastructure)	Medium	High
Coastal habitat	Medium	High
Disruption to supply chain	Medium	High
Extreme storm damage to assets	Medium	High
Flow capacity of stream channels	Medium	High
Impacts to public infrastructure	Medium	High
Physical access to facilities and project sites	Medium	High
Riverine assets (including infrastructure)	Medium	High
Riverine habitat	Medium	High
Ability to provide flood protection	Medium	Medium
Changes to regulations	Medium	Medium
Loss of FEMA certification by businesses and community	Medium	Medium
Sedimentation impact to water supply facilities	Medium	Medium
Wildfire altering the landscape and soil conditions	Medium	Medium

Extreme Precipitation

As it is likely that the frequency of extreme precipitation events will increase by mid-century, Santa Clara County is at a higher risk of storm-related flooding. This has the potential to damage public and private infrastructure, coastal and riverine habitat, and public safety. Existing flood protection facilities are vulnerable to climate-related events such as extreme storms and wildfires. For example, creek channels in the county, which are maintained to provide adequate flow capacity, can become clogged with sediment and debris following a wildfire, decreasing capacity to pass flood flows.

Operational Capacity

Valley Water's operational capability to maintain and update flood protection assets is threatened by climate change. Access to work areas (for Valley Water staff, contractors, and other partners) becomes unpredictable and unsafe during floods and these conditions may become more common as flooding becomes more frequent and severe. Flooding may also disrupt Valley Water's supply chain and make it harder to obtain the materials and equipment necessary for flood protection efforts.

Funding Security

Climate change is likely to pose challenges to securing funding for agency projects, including flood protection and flood repair projects. Regulations may be changed to create additional financial and logistical requirements for flood protection projects. An altered regulatory environment could impact Valley Water's ability to meet its commitments associated with implementing flood protection projects by increasing costs or causing delays. Increased risks to ecosystems resulting from climate change may lead to additional regulatory constraints. Such changes may lead to an increased need for coordination with regulatory agencies, as well.

Some of these costs may impact the community—for example, if climate impacts threaten the reliability of existing flood protection assets, businesses and communities may no longer qualify for Federal Emergency Management Agency (FEMA) flood protection certification and would therefore need to purchase flood insurance. Climate change can accelerate the deterioration of existing infrastructure, leading to increased operations and maintenance costs for completed projects.

3.2.3. Ecosystem Stewardship

Ecosystems are vulnerable to various climate change impacts. Some ecosystems will struggle to adapt to a changing climatic baseline as temperatures rise and precipitation patterns change. Ecosystem vulnerabilities identified in the vulnerability and risk assessment are described in Table 7.

Table 7: Ecosystem stewardship vulnerabilities with associated level of assessed risk

Vulnerability	Mid Century Risk	Late Century Risk
Ability to fund Valley Water operations	High	High
Climate-sensitive ecosystems	High	High
Stewardship or mitigation efforts	High	High
Wildfire	High	High
Habitat fragmentation impacts on species migration	Medium	High
Invasive species or plant diseases	Medium	High
Surface water quality	Medium	High
Changes to regulations	Medium	Medium
Erosion or sedimentation impacts to aquatic habitats.	Medium	Medium
Flood impacts to riverine habitats	Medium	Medium

Species Vulnerabilities

Climate change threatens biodiversity, as urban development has left species with limited room to migrate. Drier soils may impact the ability of plant species to survive in their native habitats and riverine ecosystems may experience decreasing populations of aquatic species. Climate change is likely to exacerbate the spread of invasive species and plant diseases that threaten ecosystem health. Aquatic ecosystems may see a decrease in surface water quality, which would place stress on aquatic life and could result in the spread of invasive species. Climate-related ecosystem vulnerabilities may lead to habitat fragmentation, which would impede species migration and threaten the connectivity of regional ecosystems.

Ecosystem-Scale Vulnerabilities

In addition to ecosystem vulnerabilities to changing baseline conditions, there are vulnerabilities to events (such as extreme storms, floods, and wildfires) that are projected to become more frequent and severe. Such events can create significant ecosystem damage and compromise the quality of wildlife habitat from impacts such as erosion or sedimentation.

Flooding in the Uvas River in 2019 caused ecosystem damage. Events such as flooding or wildfires may become more widespread due to climate change and create further damage across California.

Section 2.2.1 discusses water supply vulnerabilities. Some of these items create potential vulnerabilities in local ecosystems. If groundwater depletion is severe or not managed properly, lower groundwater levels could reduce discharge into groundwater dependent ecosystems (GDEs). This, in turn, could result in temporary or permanent damage to those ecosystems, even if these ecosystems are experiencing typical temperature and precipitation conditions (Klove et al., 2014).

Section 2.2.1 also discusses the potential for climate change impacts to reduce the availability of imported water. If imported water supply decreases, the need for managed recharge to local groundwater and surface water sources will intensify. The ecosystem/ habitat functions of local creeks and ponds could be impacted by altered patterns of managed recharge. This could place strain on the delicate operational balance between constraints on imported and local surface water, maintaining healthy riverine ecosystems to comply with fish regulations, and meeting Valley Water's mission to manage a safe and sustainable groundwater supply.

Vulnerabilities in Imported Water Regions

The regions from which Valley Water sources imported water are also vulnerable to climate change impacts. SLR would result in impacts to the Delta ecosystem, which in turn would impact imported water availability. SLR would increase salinity in the Delta, resulting in the need to release water from reservoirs to push salinity back in the Delta to meet water quality criteria and supply water to businesses and communities. This would impact the maintenance of cold water pools in upstream reservoirs that are crucial for supporting salmonid habitat.

Regulations and Funding Vulnerabilities

Regulations that affect agency activities in certain ecosystems may change as climate impacts occur, which could require the allotment of additional funding and resources to designing and implementing projects that result in ecosystem impacts. An example of one such risk would be increased compensatory mitigation requirements creating financial and logistical challenges for project implementation.

The State Water Resources Control Board enacted the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material into Waters of the State (Procedures, effective May 28, 2020), and Implementation Guidance requiring climate change assessment in some circumstances when permittees design mitigation. This climate change assessment is distinct from an analysis of the project's climate change effects (i.e. emissions) required by the California Environmental Quality Act (CEQA). The Procedures assessment considers potential impacts of climate change on the long-term viability and success of compensatory mitigation. Specifically, an assessment of reasonably foreseeable impacts to the mitigation associated with climate change, and any measures to avoid or minimize those potential impacts is required. The State Water Resources Control Board guidance includes risk levels for ecosystems (see Table 8).

Table 8: Factors and risk levels associated with climate change impacts to mitigation projects

Factor	Low Risk	Medium Risk	High Risk
Aquatic resource type	Lacustrine, large riverine wetlands	Perennial depressional, playas, wadable perennial streams	Seasonal depressional, vernal pools, episodic streams, slope wetlands, estuarine wetlands
Size	Large size and small edge:area ratio	Medium size and medium edge:area ratio	Small size and large edge:area ratio
Position in watershed	Upper watershed	Mid-watershed	Lower watershed

As Table 8 and the Guidelines indicate, with the exception of estuarine and coastal wetlands, aquatic resources in the upper portions of watersheds have smaller contributing watersheds, so are relatively more vulnerable to climate-driven changes in volume, timing, and duration of surface water and/or groundwater. Aquatic resources lower in watersheds are more vulnerable to cumulative change across broader landscapes. Aquatic resources providing habitat for rare, special-status, or sensitive species may be less resilient, if the species can only persist in limited environmental conditions not supported in a future climate (SWRCB 2020).

In addition to creating physical risks for ecosystems, climate change has the potential to impact Valley Water's operational capabilities regarding ecosystems. The ability to secure funding for ecosystem projects could be compromised by the financial risks associated with climate change. Additionally, overall costs associated with maintaining ecosystem health and site conditions (i.e. success or performance of mitigation habitats) required by environmental permits could increase as climate impacts occur. Currently, Valley Water utilizes planting design palettes and tools developed by Point Blue for climate-resilient riparian restoration (Parodi et al. 2014, Point Blue 2016, Point Blue 2017, Thalmayer et al. 2017).

3.2.4. Emergency Preparedness

Climate change increases the possibility of climate-related emergencies such as power outages, equipment failure due to heat stress or other climate impacts, floods, erosion, and wildfires. Table 9 describes emergency-related vulnerabilities identified in the vulnerability and risk assessment.

Table 9: Emergency preparedness vulnerabilities with associated level of assessed risk

Vulnerability	Mid Century Risk	Late Century Risk
Ability to fund Valley Water operations	High	High
Physical access to facilities and project sites	Medium	High
Availability of regional partners or contractors	Medium	Medium
Disruption of power supply	Medium	Medium
Disruption to supply chain	Medium	Medium

Emergencies

Given the unpredictability of emergency situations, emergency response is inherently challenging. Climate change is likely to increase the frequency of emergency situations and thus requires additional preparation and planning in order to ensure effective and timely responses. While specific emergency situations are discussed in the previous sections in the context of the agency vulnerability that they are most likely to impact, there are broad operational capabilities that are vulnerable to climate change but not specifically related to a single mission area, such as funding, access to work areas, and agency supply chain.

Physical access to work areas, materials, and equipment may be compromised during emergency situations. Supply chain and power supply interruptions, more common in emergencies than in normal conditions, may also threaten Valley Water's ability to respond effectively to emergencies and maintain the agency's vital functions.

The increased incidence of storms, droughts, extreme heat events, and other related emergencies could lead to variable, long-term economic impacts to Valley Water. These impacts could come in the form of litigation against Valley Water related to climate change hazards, worker compensation claims, or increased insurance premiums following emergencies. Additionally, climate-related emergencies may result in unanticipated costs associated with damage to assets or infrastructure.

3.3. Discussion

The results of this vulnerability and risk assessment are presented in specific categories, but it is important to recognize that there are many examples of vulnerabilities with the potential to impact multiple categories. Some vulnerabilities, particularly those pertaining to finance, are likely to impact all areas of Valley Water operations. Addressing vulnerabilities with the potential to impact multiple areas of agency operations will require the careful development of resilience-building actions that are sensitive to the variability of outcomes between affected areas. Furthermore, regulatory authority to manage natural resources is inherently divided among different levels of government, underscoring the need for meaningful inter-agency collaboration to address climate vulnerabilities. Although this vulnerability and risk assessment identified a broad set of impacts, it is anticipated that there will be unforeseen challenges in addressing climate change. The results of this vulnerability and risk assessment were utilized to develop a comprehensive set of goals, strategies, and possible actions to address the climate-related challenges Valley Water is likely to face. These goals, strategies, and possible actions are described in the next chapter.

Chapter 4: Goals, Strategies, and Possible Actions for Mitigation and Adaptation

Goals, strategies, and possible actions were developed to provide a framework for building Valley Water's climate resilience. In this CCAP, a goal is a broad primary outcome. There are a total of seven goals in the CCAP—three that address GHG mitigation, three that that address adaptation in each of Valley Water's mission areas—water supply, flood protection, and ecosystem stewardship—and one pertaining to emergency preparedness. Strategies have been identified to achieve each goal. Possible actions are also included as steps that can be taken to achieve strategies.

The strategies and possible actions were identified through a series of interviews with Valley Water staff, or adapted from Silicon Valley 2.0, Santa Clara County’s climate adaptation guidebook. Along with new actions, some of the possible actions included in this chapter have already been implemented as a part of Valley Water's ongoing climate change efforts. Other actions have been implemented, but could be expanded or applied more widely.

Beyond the primary intent of enabling climate mitigation and adaptation, many strategies and actions will also provide further benefits to Valley Water, the environment and residents of Santa Clara County. Typically referred to as co-benefits, these additional benefits extend above and beyond developing Valley Water's climate resilience. Although they have not been ascribed to individual actions, the following are general categories of co-benefits that implementation of this CCAP will support.

- Additional Environmental Benefits: Additional environmental benefits include benefits such as cleaner air, cleaner water, and ecosystem improvements generally. Valley Water’s operations will emit fewer air pollutants generated by the combustion of fossil fuels by reducing emissions from fleet vehicles and employee commute and procuring additional renewable energy and minimizing emissions associated with construction. Additionally, water supply adaptation actions have the potential of improving water quality along with providing a resilient water supply.
- Cost Savings: Actions that improve operational efficiency immediately translate expenses associated with electricity and fuel purchases into savings. Actions that proactively protect capital assets from long-term climate risks could avoid significant costs that would otherwise result from reactive responses to future climate impacts.
- Community Benefit: Many climate actions benefit the community beyond their adaptation or mitigation potential. For example, actions that protect and enhance recreational opportunities benefit community members for transportation and health while also restoring natural habitats and resilient ecosystems.

- Improved Collaboration and Regulatory Synergy: The scale of climate vulnerabilities and interconnectedness of natural resource governance underscores the critical importance of collaboration in pursuing climate adaptation. Actions that call for additional external coordination and partnerships with cities, agencies and other stakeholders will enhance the collective capacity for climate adaptation in the South Bay and beyond. Furthermore, this CCAP demonstrates consistency with numerous State level policies and plans that have been developed to direct regional and local efforts to address climate change.

The intent of this chapter is not to be prescriptive, but to provide an initial set of possible actions. It is expected that additional actions beyond those included in this plan will emerge through the implementation program, introduced in Chapter 5. The possible actions listed in this chapter are a subset of those listed in Appendix E, which contains a more comprehensive list of possible actions.

Climate Change Mitigation

The following goals address the ways in which Valley Water can continue to reduce its contribution to GHG emissions. In doing so, Valley Water will reduce or eliminate its contribution to climate change. The goals address emissions by scope and offer strategies and actions to reduce specific sources of emissions.

Goal 1: Reduce Direct Greenhouse Gas Emissions (Scope 1)

Reduce Valley Water's direct emissions of GHGs.

Scope 1 emissions consist of direct emissions of GHGs from Valley Water-owned sources and made up an average of 12.75% of total agency emissions between 2013 and 2017. Valley Water's main sources of Scope 1 emissions are the agency's fleet, equipment, and natural gas use. Reducing Valley Water's contributions to regional GHG emissions is a crucial component of addressing the climate change crisis. Valley Water can directly control changes in agency practices and policies to reduce its direct GHG emissions.

1.1. Strategy: Reduce GHG emissions associated with the Valley Water fleet.

Fleet emissions can be reduced by replacing older, less efficient vehicles with more fuel-efficient or electric vehicles (EVs). Valley Water plans to continue to adding electric vehicles and other fuel-efficient vehicles to its fleet, along with implementing policies to promote EV use. Examples of possible additional actions from Appendix E include:

- Expand knowledge on vehicle emission reduction techniques, devices, and equipment, and add sustainability training to regular training offers.
- Evaluate the feasibility of having a Valley Water pool vehicle(s) available for employee use at strategic locations.

1.2. Strategy: Reduce GHG emissions from trips between Valley Water offices and work sites.

Trips between Valley Water offices and fieldwork sites are a source of direct GHG emissions. These emissions have been reduced by providing more technology to support remote meetings, reducing the number of trips made, improving the availability of drop-in cubicles and pool vehicles, and by streamlining routes to minimize vehicle miles traveled (VMT). As these measures continue to be taken, emissions will continue to be reduced. Examples of possible additional actions from Appendix E include:

- Encourage remote and public transit options for off-site meetings.
- Improve and maintain remote meeting technology throughout Valley Water.
- Promote fuel-saving policies and protocols while driving Valley Water vehicles (e.g. idling policy, limiting hard braking, efficient route planning).

1.3. Strategy: Reduce GHG emissions associated with Valley Water-owned equipment.

Valley Water can continue to replace various types of agency-owned equipment with more fuel efficient or electric models to reduce GHG emissions and updating diesel engines to comply with Tier 4 diesel emissions mandate. Valley Water can further lower GHG emissions by improving the efficiency of heating and cooling equipment at agency facilities. Examples of possible additional actions from Appendix E include:

- Promote use of renewable energy for Valley Water field monitoring equipment.
- Incorporate best practices to reduce emissions from natural gas, currently used in heating and cooling Valley Water facilities.

1.4. Strategy: Minimize GHG emissions associated with planning, design, construction, operation, and maintenance of capital projects.

It is important to plan and design capital projects in a climate-conscious manner that considers their near- and long-term contribution to Valley Water emissions. Project design instructions can be updated to prioritize the use of efficient technologies during construction, operation, and maintenance of capital projects. Examples of possible actions from Appendix E include:

- Incorporate energy, water, and fuel efficiency into capital project planning, design, and long-term maintenance.

- Update internal capital project work instructions to incorporate GHG reduction measures, such as Leadership in Energy and Environmental Design (LEED)/ Envision certification elements, and considerations for continued maintenance with input from capital project staff and O&M.

- Promote knowledge and offer training on construction-related emission reduction technologies, devices, and equipment.

1.5. Strategy: Increase GHG sequestration on Valley Water properties and other areas.

Increasing carbon sequestration, or capturing and storing carbon dioxide, is a way for Valley Water to compensate for its direct GHG emissions. This is currently performed by planting native and drought-tolerant plants with high carbon sequestration rates in mitigation, enhancement, and landscaping projects. An additional example of a possible action from Appendix E is:

- Evaluate the need for purchasing carbon offsets to sequester carbon in non-Valley Water areas, such as the Sacramento-San Joaquin Delta region, as a method for maintaining carbon neutrality.

1.6. Strategy: Continue to update Valley Water's GHG accounting practices.

Using the best available methodology to calculate agency emissions is needed to accurately track efforts towards GHG reductions. This has included continuously updating the methods used to calculate Valley Water's GHG inventory to utilize best practices for prior inventories. . Moving forward, Valley Water can continue to expand the inventory to account for additional sources and sinks of GHGs, such as restoration projects and biological processes from water treatment and reservoirs. Additional sources of GHGs, such as emissions from construction, could be considered for inclusion. Updating Valley Water's methodology could help in developing and prioritizing the agency's continued efforts to reduce GHG emissions. A comprehensive list of actions taken by Valley Water to update accounting practices can be found in Appendix E.

Goal 2: Expand Renewable Energy and Improve Energy Efficiency (Scope 2)

Expand procurement of energy from renewable sources and improve the energy efficiency of Valley Water's facilities.

GHG emissions from purchased electricity are considered Scope 2 emissions. About 95% of Valley Water's purchased energy is provided by PWRPA, a Joint Powers Authority that provides energy from utility-scale solar projects and hydroelectricity. Valley Water has been a member of PWRPA since 2004. Scope 2 emissions typically make up a small part of Valley Water emissions. In 2016, purchased electricity accounted for only 1% of total emissions. Scope 2 emissions may account for a higher percentage of Valley Water emissions in years when PWRPA's proportion of hydroelectricity is lower due to drought. For example, purchased electricity accounted for approximately 28% of total Valley Water emissions in 2015.

2.1. Strategy: Continue to support increased renewable energy in the agency's energy portfolio.

Continuing efforts can further expand renewable and carbon-free energy procurement for the agency's remaining energy demand. An additional possible action from Appendix E includes:

- Examine and pursue opportunities to increase renewable energy in Valley Water's energy portfolio.

2.2. Strategy: Continue to improve energy efficiency at agency facilities.

Valley Water can continue to optimize energy use and reduce overall demand for purchased electricity. Energy efficiency can be improved throughout Valley Water, from workplaces to water treatment facilities. This can be achieved by improving the efficiency of office equipment and expanding energy and water saving measures through the Green Business Program's certification. Additionally, Valley Water can further develop a policy that improves building sustainability, maintain regular energy assessments, and implement energy-saving technologies as they become available. Valley Water can also promote energy efficient behaviors through staff education. Valley Water can continue monitoring energy optimization practices and expand the most impactful efforts.

Goal 3: Reduce Indirect Greenhouse Gas Emissions (Scope 3)

Reduce Valley Water's indirect emissions of GHGs.

Scope 3 emissions are indirect emissions that occur as a result of Valley Water's operations but are emitted from sources not owned or controlled by Valley Water. Three sources of Valley Water's indirect emissions are employee commutes, business travel and imported water operations. While not quantified at this time, less significant sources of indirect emissions (such as solid waste and wastewater, purchasing, and investment) can also be reduced to further Valley Water's commitment to a reduced carbon footprint.

Strategies for reducing emissions from imported water operations are largely collaboration-based, as the carbon intensity of imported water operations cannot be controlled by Valley Water. Goal 4, which covers water supply adaptation, proposes actions that focus on expanding local, climate-resilient sources of water. These sources of water are less carbon-intensive than imported water. Implementing these actions could lower Valley Water's dependence on imported water, thereby reducing Valley Water's indirect emissions.

3.1. Strategy: Reduce emissions from Valley Water employee commutes.

Employee commutes make up approximately 10% of Valley Water's total yearly emissions. Policies that allow alternative schedules, incentivize in-county housing, and increase the accessibility of public transit can all contribute to reducing indirect GHG emissions. In addition, continuing to invest in EV charging stations and improve the convenience of their use can further incentivize low-emission commuting. An example of a possible action from Appendix E is: Develop policies and best practices to promote successful telework agreements and outcomes for compatible positions.

3.2. Strategy: Reduce waste produced at facilities.

Valley Water's indirect emissions from waste can be minimized by agency policies and procedures that make work processes electronic, discourage staff from using disposable items, and spread information about the climate impacts of waste. The implementation of an agency-wide approach to waste can guide Valley Water to further reduce waste generated from our operations. Current practices include expanding electronic document management to minimize paper-use, along with making double-sided printing the default and minimizing single-use items in Valley Water facilities. Examples of possible actions from Appendix E include:

- Expand waste reduction measures as a part of the Green Business Program
- Develop an agencywide approach for diverting and minimizing wastes.

3.3. Strategy: Continue to create and expand other efforts to minimize indirect emissions.

Valley Water's purchasing power and investment activities can be leveraged to minimize indirect emissions. Specific methods of accomplishing this would be to spread awareness of Valley Water's purchasing policy that considers environmental implications, and to continue divesting from major polluters. Other areas in which Valley Water will maintain its work relative to this goal include supporting California's Department of Water Resources (DWR) efforts to lower the carbon intensity of imported water, and strengthening a sustainability training program for Valley Water employees including spreading awareness of low carbon meals such as vegetarian and locally sourced food. Valley Water can also continue divestment efforts from companies with significant carbon footprints. These actions in addition to others that Valley Water hopes to continue in order to reduce indirect missions can be found in Appendix E.

Adaptation

Climate change already threatens Valley Water's operations and the communities that it serves. Adaptation is critical to ensure that Valley Water's operations are resilient to anticipated climate threats. The following goals are organized by the three main aspects of Valley Water's operations and examine the ways in which it can become and remain resilient to climate changes.

Goal 4: Water Supply Adaptation

Maximize the climate resilience of the county's water supply.

As Santa Clara County's water wholesaler, Valley Water must maintain a stable and climate resilient water supply and prepare infrastructure for the impacts of climate change. To achieve this, Valley Water needs to prepare for the effects of climate change on the availability and sustainability of its local and imported water supplies, both of which are threatened by climate impacts. Valley Water also plays an important role in fostering demand management and water conservation within the County.

4.1. Strategy: Expand and diversify local water supplies.

Imported water sources are especially vulnerable to the effects of climate change. Valley Water must expand and diversify local water supply, focusing on climate resilient local sources of water. This can be achieved by continuing to implement local water supply projects included in the Water Reuse and Water Supply Master Plans, such as those which increase recycled water availability, local groundwater recharge, and stormwater capture. Examples of possible additional actions from Appendix E include:

- Increase capture of stormwater and floodwater, such as through green infrastructure projects.
- Resolve regulatory challenges to innovative local water solutions and increase coordination on alternative water uses.

4.2. Strategy: Improve demand management and support water conservation efforts.

Valley Water can prepare for climate impacts on water supply by encouraging more efficient use of water through implementing demand management and water conservation efforts. Collaboration between the various water management stakeholders is critical to maximize the success of this adaptation strategy. Examples of possible actions from Appendix E include:

- Support programs to reduce pipeline leakage.
- Increase coordination between Valley Water, land use agencies, and water retailers on water and land use management.
- Promote efforts related to water conservation and reuse.
- Engage in proactive, consistent, and coordinated drought and water shortage contingency planning.

4.3. Strategy: Increase reliability of imported water.

Imported water is a crucial component of Valley Water's water supply and climate change threatens both its quantity and quality. Valley Water will continue to collaborate with providers of imported water regional and statewide issues including Sacramento-San Joaquin Delta watershed management to protect critical imported water assets from flood risk and foster ecosystem health and connectivity. In addition, Valley Water can continue to support and invest in state and regional watershed policy solutions along with the storage and conveyance solutions outlined in the Water Supply Master Plan. Examples of possible additional actions from Appendix E include:

- Collaborate on and support Sierra Nevada watershed protection and restoration projects.
- Support State efforts to develop emergency preparedness plans to respond to large Delta levee failure events that threaten imported water supplies.

4.4. Strategy: Support efforts to maintain and enhance source water quality.

Water quality is likely to be affected by climate change impacts. For example, higher temperatures may increase the growth of algae (including HABs) or pathogens in reservoirs. Rising sea levels may increase salt-water intrusion into our groundwater and imported water supplies. In order to anticipate and address these changes, Valley Water can contribute to improvements that expand monitoring and maintenance of source water quality throughout the county and Central Valley. As a part of this strategy, Valley Water can continue to support improvements in local land management practices using the latest science and technology which can then help maintain or enhance local water quality. Examples of possible additional actions from Appendix E include:

- Expand participation in collaborative projects focusing on protecting and improving imported source water quality, such as with State Water Contractors, DWR, the US Bureau of Reclamation, and CDFW.
- Expand support for local and imported source water quality efforts, through outreach on water reuse and source water quality.

4.5. Strategy: Implement source water improvement and water treatment actions.

Valley Water can lead planning efforts and research strategies to maintain and improve water quality in response to climate impacts. This is currently done through preparing and implementing a Source Water Quality Improvement Plan. Examples of possible additional actions from Appendix E include:

- Design and develop invasive species control strategies for Valley Water's facilities and conveyance structures that are specific to target organisms.
- Promote and participate in research projects related to climate change impacts on source water quality.
- Conduct a study to identify potential adaptive water treatment actions that increase the resilience and flexibility of treatment systems to the impacts of climate change.

4.6. Strategy: Increase flexibility and resilience of water utility operations and assets.

Valley Water's extensive network of water utility assets will be vulnerable to climate impacts, such as the increased incidence of extreme weather events. Expanded forecasting and planning efforts can be undertaken to ensure the near- and long-term integrity of these assets and their operations for the safety of people, infrastructure, and ecosystems within the county and related to imported water operations. Examples of possible actions from Appendix E include:

- Expand efforts to improve the resilience of local and imported storage, managed recharge facilities, and conveyance and increase groundwater storage.
- Expand the development of asset management plans that incorporate the latest climate change science and solutions.
- Address aging infrastructure through continued implementation of the 2016 Infrastructure Reliability Plan.
- Improve hydrologic forecasting to better adapt to changing hydrology and extremes.

4.7. Strategy: Support ecological water supply management objectives.

Appropriate management of the county's waterways and careful consideration of environmental impacts to the Sacramento San Joaquin Delta ecosystem is not only crucial for water supply, but integral to maintaining ecological stability. To this effect, water supply planning and operations should consider the effects of climate change on aquatic ecosystems. Valley Water currently participates in joint efforts with partner water agencies to support ecosystem restoration, research, and management along with participating in statewide environmental flows discussions. Furthermore, Valley Water can continue to implement adaptive management to support fisheries, such as the Fisheries and Aquatic Habitat Collective Effort (FAHCE). An additional action from Appendix E is listed below.

- Develop climate resilient water supply options to support fisheries and other aquatic and stream-dependent resources.

Goal 5: Flood Protection Adaptation in Santa Clara County

Ensure that residents, infrastructure, and waterways are protected from the risks associated with increased flooding.

Santa Clara County's flood-related risks will increase due to climate change impacts such as increasing storm intensity and SLR. Valley Water must continue to reduce flood risk to natural and built environments and work with stakeholders to maximize flood preparedness. Valley Water will need to anticipate and plan for the specific impacts of flooding on agency assets and ensure the agency's continued ability to provide flood protection and flood response.

5.1. Strategy: Minimize riverine flooding risks.

Climate change impacts on the frequency and severity of fluvial flooding are difficult to predict with certainty. Valley Water must incorporate this uncertainty into planning future flood protection projects. Risk can be reduced in fluvial (riverine) areas by implementing projects that enhance flow capacity and improve infiltration by widening and restoring floodplain, stream-upland transition areas, and upland buffers around streams. Natural flood protection projects that incorporate stormwater infiltration have multiple benefits; they improve stream water quality, promote aquifer recharge, and lower flood risk. Valley Water can achieve this through expanding procedures to plan and design capital projects around long-term stream resilience. Examples of possible additional actions from Appendix E include:

- Research, design and implement multi-benefit flood protection projects such as green infrastructure to increase channel conveyance capacity and protect or improve ecosystem resilience.
- Create natural floodplain areas, stream-upland transition areas, and upland buffers around streams.
- Expand procedures to plan and design capital projects for long-term stream resilience.

5.2. Strategy: Minimize flood risk in coastal areas.

Areas near San Francisco Bay are vulnerable to flooding from SLR and storm-related inundation. To enhance coastal flood protection, Valley Water must incorporate SLR projections into flood protection projects and continue to support collaborative efforts to improve the connectivity of coastal and tidally influenced areas, including natural bay-shore ecosystems. This can be done by continuing to work on capital projects and coordination with cities to address SLR related flooding risks, such as the South San Francisco Bay Shoreline Project.[11,12] Furthermore, Valley Water can maintain efforts to incorporate SLR data in flood protection projects and establish a Valley Water standard for SLR. A few possible additional actions from Appendix E include:

- Expand collaboration on fluvial and coastal flood protection projects consistent with the Natural Flood Protection (NFP) procedures.
- Increase the connectivity of coastal habitats along the Bay's shoreline with the tidal zones of streams, including wetland restoration and ecotone levees (SFEI, 2017).
- Install tidal gages to monitor local SLR.

5.3. Strategy: Improve the flood preparedness of people, property, and habitat.

As Santa Clara County's flood protection agency, Valley Water facilitates access to information to prepare for flooding events. The creation of a flood warning system developed in collaboration with other local agencies could help avoid flood-related damage and minimize threats to safety. Continuing to enhance monitoring and maintenance programs of flood protection infrastructure can similarly improve flood preparedness, along with maintaining coordination with stakeholders, land use agencies and municipalities. Additionally, Valley Water can continue to obtain land in areas vulnerable to flooding for the purpose of improved flood protection and channel restoration, when possible. Examples of possible additional actions from Appendix E include:

- Coordinate with land use agencies to protect and restore historic floodplain areas and vegetated buffers along creeks.
- Consider relocation, purchase and/or structure elevation of properties subject to recurring flooding risk, when possible.

[11] County of Santa Clara Office of Sustainability and Climate Action. 2015. *Silicon Valley 2.0: Climate Adaptation Guide.*
[12] The Shoreline Project is currently under construction and will provide FEMA protection for up to a 100 year storm event with 2.59 ft of sea level rise.

5.4. Strategy: Implement projects and plans to increase the flexibility and resilience of flood protection operations and assets.

Valley Water's infrastructure and assets will be more vulnerable to damage as flooding risk increases. Planning efforts should consider this risk and incorporate additional provisions for flood protection into all phases of project planning. Additionally, flood protection measures that have been proposed by past plans but have not been implemented should be assessed for consideration of climate risk and implemented in a timely manner. In addition, optimization of reservoir management can continue to minimize impacts from extreme storm events and thus increase the resilience of these areas. Examples of possible actions from Appendix E include:

- Develop planning, design, and maintenance procedures to address assets' climate related flood impacts.
- Develop asset management plans for flood protection assets that incorporate climate change solutions and promote adaptation, resilience, and flexibility.
- Implement projects that maximize streams' climate resilience. Update stream maintenance to integrate larger stream functions and consider the impacts of climate change.
- Implement the flood protection measures included in existing plans, such as the One Water Plan and Storm Water Resources Plans.

5.5. Strategy: Expand the use of flood forecasting and modeling tools in the planning and design of agency projects to maximize protection from flood risks.

Current information on flooding risk will become outdated and inadequate in the context of a changing climate. For this reason, up-to-date forecasting and modeling are essential for successful adaptation. Valley Water can continue to leverage tools from FEMA, USGS, BCDC, and other agencies to evaluate flood risk. Furthermore, the monitoring and maintenance of assets can be enhanced by expanding the use of rain and stream gauges to help identify areas with a risk of flooding during storm events. Finally, Valley Water can continue to consider hydrology and hydraulics modeling that accounts for climate change in planning and design of all Valley Water projects. Doing so would allow for consideration of increased flood flows to enhance flood resilience of future projects. Examples of possible additional actions from Appendix E include:

- Model predicted changes in the frequency and magnitude of flooding events[13] to inform project planning and design.
- Seek additional technologies to improve forecasting of floods, storm surges, and other events resulting from rising sea level and changing flood patterns[14].

Goal 6: Ecosystem Adaptation in Santa Clara County

Protect and enhance ecosystem health to build climate resilience.

Native ecosystems in Santa Clara County will be forced to adapt to the region's changing climatic baseline. Regional ecosystem health has been compromised by Santa Clara Valley's long history of development. Ecosystems continue to experience the adverse impacts of urban land use. Valley Water can work to maximize ecosystem resilience to climate change through watershed stewardship, natural flood protection, and water supply reliability projects, programs, and partnerships.

6.1. Protect and enhance riverine, coastal, and other watershed ecosystems to improve climate change resilience.

Climate change amplifies environmental stresses to species. It is important to conserve as much ecosystem area and variety to help fish, wildlife, and plants adapt to climate change and sustain diverse and healthy populations. Valley Water incorporates environmental conservation and restoration into its water supply and flood protection activities. This includes the goal of keeping ecosystems as healthy as possible for their intrinsic value, their ability to provide habitat for species, their flood protection benefits, and their impact on regional water quality. Moving forward, Valley Water should also identify and incorporate climate-resilient best practices in its stewardship projects and programs. To achieve this, Valley Water can continue to complete Integrated Water Resources Master Plans for each watershed as part of the One Water program. In addition, continuing to effectively manage surface water quality in creeks and reservoirs and addressing algal blooms and mercury contamination in Valley Water's reservoirs can support the health and resilience of riverine, coastal, and other watershed ecosystems. Examples of possible additional actions from Appendix E include:

- Expand efforts to protect, restore, enhance, and maintain riparian areas and wetlands, and transitional and upland buffers around those features.

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[13] County of Santa Clara Office of Sustainability and Climate Action. 2015. *Silicon Valley 2.0: Climate Adaptation Guide.*

[14] Valley Water's existing flood forecasting system, which is installed in some creeks in Santa Clara County, uses rainfall forecasts to predict creek hydrographs and anticipates flood risk a couple of days in advance. This system could be refined and installed in additional locations.

- Identify and prioritize habitat enhancement needs and incorporate into stream stewardship and mitigation projects using watershed profiles developed through the One Water Plan.
- Develop climate-resilient best practices to be used in the implementation of habitat conservation and restoration activities, including upper watershed areas that drain to creeks and baylands.
- Consider Board of Directors' policies that promote environmental stewardship principles to address climate change impacts (e.g. improve land connectivity, watersheds, and green stormwater infrastructure).

6.2. Develop and expand programs and plans that support more climate-resilient ecosystems.

Restoring aquatic habitat connectivity in Santa Clara Valley's stream ecosystems will increase the resilience of native fish to a shifting climate. Contiguous riparian corridors provide similar benefits to birds and wildlife, and upland, regional habitat connectivity is critical to the adaptive capacity of predator populations. Valley Water must balance its water supply and flood protection missions with environmental stewardship, and should continue to restore vital stream habitat connectivity while also supporting landscape-scale ecosystem resiliency through grants and partnerships. In order to achieve this, Valley Water can maintain its funding of relevant habitat restoration projects along with continuing to work towards a geomorphic watershed approach when designing stream and mitigation projects. Furthermore, Valley Water can continue to support and expand funding partnerships with regional land conservation and management agencies to promote landscape-scale habitat linkages and preserve conservation values. Examples of additional actions from Appendix E include:

- Support mutually beneficial inter-agency programs, plans, and projects that restore regional ecosystems.
- Consider Board policies to promote habitat connectivity when planning, designing, operating, and maintaining Valley Water's flood protection and water supply infrastructure.
- Expand the Guidelines & Standards for Land Use Near Streams (Water Resources Protection Collaborative) to include climate change resilience considerations.
- Improve aquatic habitat connectivity through the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) and other programs and projects.
- Develop policies and guidelines for handling effects of wildfires.

6.3. Strategy: Expand the availability of data on regional ecosystems to avoid detrimental climate change-related ecosystem impacts.

As climate change becomes more apparent in regional ecosystems, it will be important to use accurate, long-term data to detect and respond to these climate change impacts. Collaboration and data sharing with other stakeholders in ecosystem management is essential to maintaining the integrity of ecosystems throughout the county and region. Valley Water plans to continue collecting baseline information about natural assets for the purpose of guiding future restoration activities. Examples of possible additional actions from Appendix E include:

- Expand monitoring and modeling of the effects of climate change-related events (e.g., droughts and wildfires) on ecosystems, stream flows, and water quality to avoid detrimental impacts[15].
- Research climate impacts on invasive species to guide efforts at prevention and removal[16].
- Participate in research projects related to climate impacts on Valley Water's mission areas, including water supply management, watershed studies, ecological conditions, and impacts of wildfire on water quality.

Emergency Preparedness

Given the unpredictability of climate impacts, it is necessary to prepare for the increase in emergencies that Valley Water is likely to face due to climate change. Valley Water's goals and strategies towards emergency preparedness can help ensure the safety and wellbeing of its community and operations.

Goal 7: Emergency Preparedness

Maximize resilience to climate change-related emergencies.

The prevalence of climate-related emergencies will rise as the impacts of climate change become more apparent in the Bay Area and statewide. Valley Water can improve the effectiveness of both its inter-agency and community-wide emergency plans and procedures in order to be prepared for climate-related emergencies.

7.1. Strategy: Maximize Valley Water's emergency preparedness for climate related impacts.

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[15] County of Santa Clara Office of Sustainability and Climate Action. 2015. *Silicon Valley 2.0: Climate Adaptation Guide.*

[16] County of Santa Clara Office of Sustainability and Climate Action. 2015. *Silicon Valley 2.0: Climate Adaptation Guide.*

In order to be prepared for the increasing prevalence of climate-related emergencies, such as floods, extreme heat events, fires, or severe storms, Valley Water can improve its internal procedures for emergency education and response as well as its engagement with external emergency planning groups. Having the necessary knowledge, training, and the appropriate physical capacity to respond to emergency situations will ensure that Valley Water remains resilient and prepared. In order to do so effectively, Valley Water can continue to develop a centralized approach to understand future climate changes and impacts through the development of climate modeling and analysis methods, such as preferred general circulation models (GCMs) and downscaling methods. These would be used throughout Valley Water to assess, predict, and respond to climate change. Examples of possible additional actions from Appendix E include:

- Expand and improve Valley Water procedures for responding to climate-related emergencies.
- Expand and improve staff training on emergency response.
- Ensure safety and continued operation of Valley Water assets during climate-related emergencies.

Chapter 5: Next Steps

The CCAP sets overall goals, establishes strategies, and suggests possible actions to provide a foundation for Valley Water's response to climate change. Implementation of this plan will require continued involvement from Valley Water staff and engagement with relevant stakeholders. The implementation of two initial actions are the first steps to achieving the goals set forth in this plan. These items, which involve an update to the BOD's carbon neutrality policy and development of the CCAP implementation program, are outlined below.

5.1 Revision of Existing Carbon Neutrality Policy

The first action proposed for the initial implementation of the CCAP is an update of the BOD's carbon neutrality policy. Since the carbon neutrality policy was enacted in 2012, Valley Water has been successful in achieving carbon neutrality in most years. It is recommended that the BOD update the carbon neutrality policy to continue mitigating Valley Water's GHG emissions to meet or exceed carbon neutrality in years beyond 2020. Currently, Valley Water's Board Policy and Planning Committee is providing guidance on updated policies related to climate change.

5.2 Development and Launch of CCAP Implementation Program

Valley Water's CCAP is developing an ongoing implementation program in order to successfully achieve its goals. The CCAP program will build capacity for Valley Water to implement its CCAP. An implementation team, made up of staff representing various areas of Valley Water operations, is proposed to manage this Climate Change Action Implementation Program (CCAP program or program). The implementation team will facilitate the prioritization and development of specific actions and the development of workplans and budgets. The implementation team will also track and monitor progress towards climate resilience. This will be done through a highly collaborative approach, as actions identified in the CCAP touch nearly every facet of Valley Water operations. The launch of this program will ensure the goals and strategies in the CCAP are implemented through an inclusive, iterative and adaptive process.

Purpose of the Implementation Program

Broadly, the purpose of the CCAP program will be to instill climate change actions within Valley Water operations. In other words, climate change actions will be mainstreamed into operations, including by incorporating climate change considerations into existing work procedures such as Quality and Environmental Management Systems (QEMS), natural flood protection (NFP), etc. As stated above, the CCAP program's purpose is:

- Develop and prioritize specific actions with workplans and budgets
- Ensure coordination and communication
- Implement actions
- Monitor and report on progress towards GHG reductions and adaptation

Process for Implementation Program Development and Maintenance

The implementation program development began in 2020 with the support of a CivicSpark fellow who helped to complete the CCAP and begin the development of this program. The program will be inclusive of internal stakeholders from all impacted areas of the agency. With facilitation by and support from the CCAP implementation team, these stakeholders will use their expertise to finalize and prioritize actions that consider both CCAP goals and the priorities and budgets of individual workgroups. Unit-level points of contact will be developed for climate issues and questions, creating a network of agency staff that can support each other through the implementation process.

One of the central environmental challenges that the implementation plan will address is the role of uncertainty and need for adaptive management. Climate change projections are frequently updated and reflect a range of possible impacts rather than a singular, definitive impact. Given this fact, it is essential that the procedures for CCAP implementation allow for flexibility in developing and executing specific actions.

The implementation program will also include updates to Board Committees, the Board of Directors, staff, and external stakeholders. The CCAP implementation team will manage this collaborative process.

Key Components of the Implementation Program

While the CCAP program will evolve to reflect changing circumstances, there are a few key elements of the program. These elements are to finalize and perform a set of actions to achieve strategies, metrics to evaluate and report on success of implemented projects, and a clear system of reporting and outreach to accompany the individual actions.

Finalize and Perform Actions for Climate Resiliency

An initial step of the CCAP program is to select, prioritize, and finalize the possible actions that were developed by the CCAP. A quantitative methodology for selection and prioritization of actions is being developed. Actions will be assessed for criteria relevant towards meeting specific CCAP goals and their expected co-benefits, such as benefits to disadvantaged communities. Resource availability will also be considered in the prioritization and selection of actions for implementation. Quantifying the level of GHG reduction is an important criteria for prioritizing mitigation actions. The level of risk associated with a vulnerability is an important criteria for guiding prioritization of adaptation actions.

Program staff will work with workgroups to determine the appropriate method to achieve an action. Program staff will also facilitate developing schedules, budgets, and workplans for actions, including ownership and scope. In addition, the CCAP program will work to ensure that a project's stakeholders collaborate in determining the best methods to ensure project resilience. For example, it is crucial that O&M units have the ability and resources to monitor and maintain CCAP actions after they are implemented, in order to ensure that they continue to contribute to climate preparedness. Program staff may lead implementation of mitigation and adaptation measures that improve sustainability at Valley Water's campus.

Success Metrics for Completed Projects and Actions

Projects that have been implemented will be monitored and tracked in order to accurately understand progress towards the CCAP's goals. Program staff will also continue to track metrics available through the Climate Change Registry. Program staff will develop metrics to assess actions to determine their success, and to inform future efforts. Budgetary metrics will ensure that the program is filtering for actions that use funding effectively. Some metrics will vary depending on the type of action—infrastructure projects can be assessed for their physical resilience to realized climate impacts, whereas outreach efforts may be assessed using both qualitative and quantitative factors.

It is recommended that the implementation program include a centralized approach for climate projections (e.g., preferred GCMS, RCPs, downscaling methods, etc.) and handling specific data related to CCAP actions in each of Valley Water's mission areas. This will help Valley Water staff to assess, predict, and respond to climate change impact effectively and consistently across work areas. This centralized approach would need to be reassessed on a regular basis for agreement with the latest climate science.

Subsequent Reporting and Outreach

The CCAP program will be regularly assessed and progress will be reported to the Board, stakeholders, and the public. Additionally, the CCAP will be updated as needed. Program staff will engage in outreach activities with stakeholders to ensure participation in CCAP actions as needed. Reporting and outreach will be crucial in guiding the agency towards a way of operating that incorporates and appropriately prioritizes climate considerations. Ultimately, the CCAP program will instill climate resilience as a priority throughout Valley Water's many areas of work by building upon and expanding the agency's existing climate-related efforts.

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Appendix A: Climate Change Framework Roles

(To be updated with latest subject matter experts)

Climate Change Role	Assigned Staff
Lead Manager (Adaptation)	Vincent Gin
Lead Manager (Mitigation)	Bhavani Yerrapotu
Lead Subject Matter Experts	
Water Utility Enterprise	Samantha Greene
Natural Flood Protection	Liang Xu
Environmental Stewardship	Lisa Porcella
GHG Mitigation	John Brosnan
Subject Matter Experts	
Climate Change Science and Weather	Cris Tulloch
Water Supply	Jing Wu
Imported Water	Frances Brewster
Water Demand	James O'Brien
Sea Level Rise	Rechelle Blank
Flood Protection Design	Ngoc Nguyen
Water Quality/Green Stormwater Infrastructure	Kirsten Struve
Extreme Climate Change and Emergency Planning	Alexander Gordon
Hydrology	Liang Xu
Habitat	Doug Titus
Biology (Flora)	Janell Hillman
Biology (Fauna)	Doug Padley
Shoreline	Afshin Rouhani
Energy Use	John Brosnan
Embedded Energy	Jeannine Larabee
Regulations and Reporting	Sarah Young
Buildings and Grounds	Jesse Soto
Climate Change Reports and News (Climate Change Portal)	Bob Teeter
Communications Support	Matt Keller

Appendix B: Table of Relevant Board Policies and Goals

Valley Water's policies are currently being updated. This table will be revised following these updates.

Board Item	Language
Policy No. E-1 (Mission and General Principles)	Provide Silicon Valley safe, clean water for a healthy life, environment, and economy.
	General Principle 1.1: An integrated and balanced approach in managing a sustainable water supply, effective natural flood protection, and healthy watersheds is essential to prepare for the future.
	General Principle 1.4: A net positive impact on the environment is important in support of the District mission and is reflected in all that we do.
Policy No. E-2 (Water Supply)	There is a reliable, clean water supply for current and future generations.
	Water Supply Goal 2.1: Current and future water supply for municipalities, industries, agriculture, and the environment is reliable.
Policy No. E-3 (Natural Flood Protection)	There is a healthy and safe environment for residents, businesses, and visitors, as well as for future generations.
	Natural Flood Protection Goal 3.1: Provide natural flood protection for residents, businesses, and visitors.
	Natural Flood Protection Goal 3.2: Reduce potential for flood damages.
Policy No. E-4 (Water Resources Stewardship)	There is water resources stewardship to protect and enhance watersheds and natural resources and to improve the quality of life in Santa Clara County.
	Water Resources Stewardship Goal 4.1: Protect and restore creek, bay, and other aquatic ecosystems.
	Water Resources Stewardship Goal 4.3: Strive for zero net greenhouse gas emission or carbon neutrality.
Policy No. EL – 4 (Financial Management)	Financial planning for any fiscal year shall be aligned with the Board's Ends, not risk fiscal jeopardy, and be derived from a multi-year plan. With respect to the actual, ongoing financial condition and activities, the BAOs shall provide for the development of fiscal sustainability.
	No investments will be made in fossil fuel companies with significant carbon emissions potential.

Appendix C: Links to Relevant Plans and Programs

Valley Water Plans and Programs

Link
Local Hazard Mitigation Plan
One Water Plan
Water Supply Master Plan (WSMP)
Groundwater Management Plan
Safe, Clean Water and Natural Flood Protection Program
Santa Clara Basin Storm Water Resources Plan
South County Stormwater Resource Plan
Stream Maintenance Program (SMP)

Collaborative Plans and Programs

Link
South Bay Salt Pond Restoration Project
South San Francisco Bay Shoreline Project
Integrated Regional Water Management Plans (IRWMP)
Valley Habitat Plan (VHP)
Silicon Valley 2.0
Santa Clara Valley Agricultural Plan

Appendix D: Methodology to Calculate Carbon Emissions and Offsets

Brief Overview

The District's carbon footprint includes emissions from the Scope 1 (Fleet), 2 (Electricity Purchase) and 3 (Imported Water, Employee Commute and Employee Travel) activities. Carbon offsets account for carbon emissions avoided from water conservation, water recycling, hydroelectricity or solar production, carbon sequestered from habitat restoration, enhancement or preservation and the green business program.

The methodology was applied to District operations using actual data for calendar year 2010 and projected data for 2020. The emissions and offset are calculated in metric tons of CO_2 e emission per year (MT/Year). For Calendar Year (CY) 2010 data, actual data from best available sources were obtained. For CY 2020, the projection is based on the percent change in the water supply portfolio compared with CY 2010, applying the same assumptions.

Table 1. Water Use and Projected Use (Acre Feet) for CY 2010 and 2020

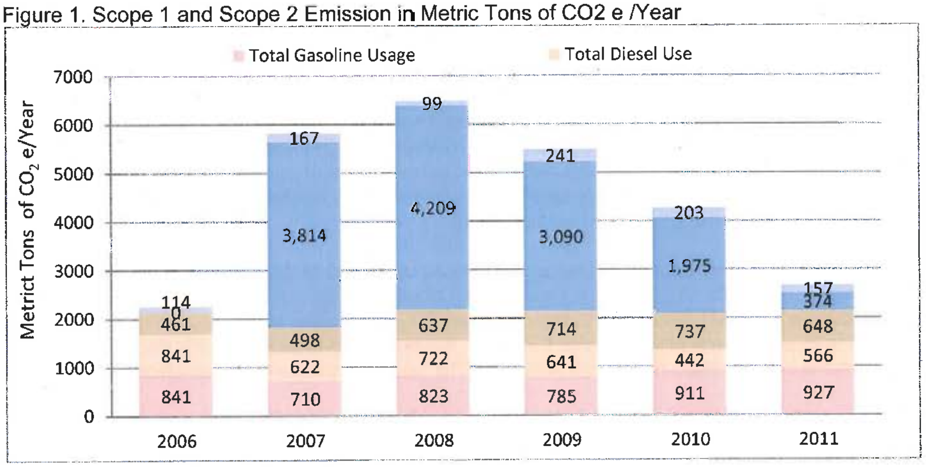
Water Supply Sources	2010	2020	% Change
A. Local Surface Water	111,000	90,900	
B. Natural Groundwater Recharge	50,000	61,200	-6%
C. Import from State Water Project	45,900	60,200	31%
D. Import from Central Valley Project	83,600	109,700	31%
E. Import from San Francisco Public Utilities Commission	49,700	60,600	22%
F. Water Conservation	51,000	76,100	49%
G. Recycled Water	14,700	22,100	50%

Carbon Footprint

Scope 1 and Scope 2 Emissions

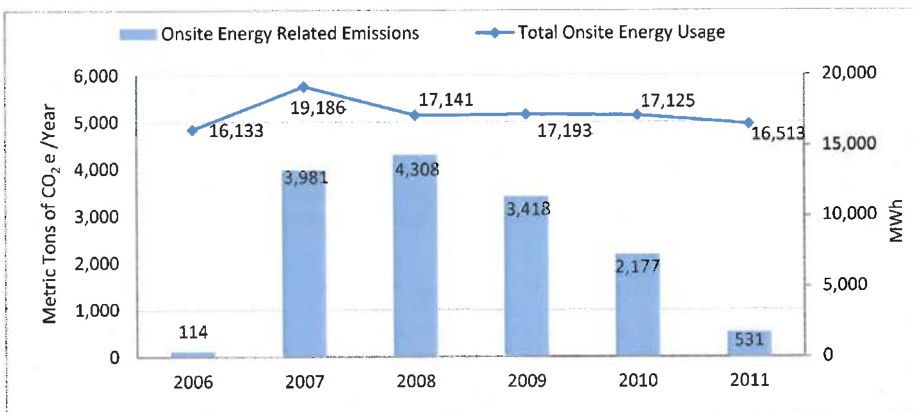
Scope 1 and 2 emissions are based on the Climate Registry's General Reporting Protocol. Figure 1 illustrates six years of Scope 1 and 2 GHG emission inventories via the California Climate Action Registry or the Climate Registry. It depicts relative stable amount of emissions from fleet or natural gas uses, while great fluctuations in emissions from the Power and Water Resources Pooling Authority (PWRPA) and PG&E energy sources.

Figure 1. Scope 1 and Scope 2 Emission in Metric Tons of CO2 e /Year



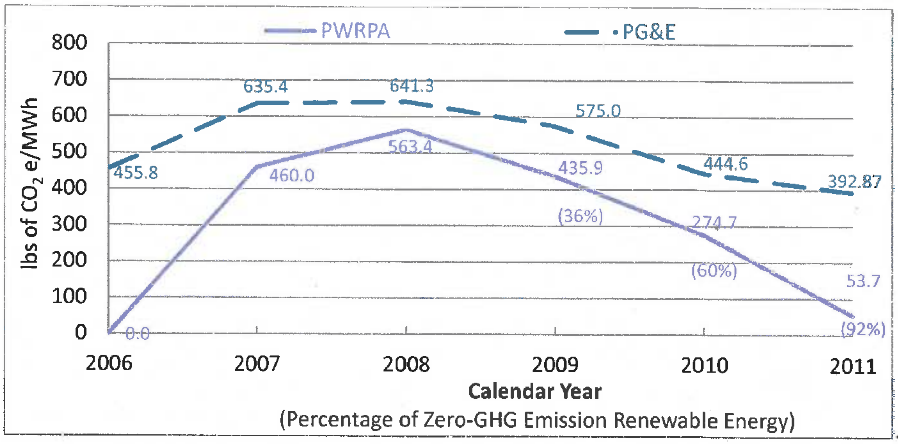
As shown in Figure 2, total onsite energy use averages about 17,000 MWh Per Year, with the exception of CY 2007, while onsite energy related emissions fluctuated from 114 to 4,308 MT/Year.

Figure 2. Onsite Energy Use and Related Emissions



Much of fluctuation comes from changes in PWRPA's emission factors (see Figure 3), as PWRPA energy accounts for about 95% of the total energy directly purchased by the District.

Figure 3. Changes in PG&E and PWRPA's Emission Factors



Specifically, for CY 2010, 94% of the District's directly purchased energy came from PWRPA and onsite solar production. In addition to zero-emission solar power, the District works with two energy suppliers with significant share of renewables in their respective portfolio. The emission factor for PWRPA is about 25% lower than PG&E. PG&E's emission factor is about half of the national average. Both are well below the California average. For CY 2006, a very wet year, PWRPA achieved carbon free energy, resulted in the lowest emission reported by the District. For CY 2011, PWRPA's emission factor reflects a 92% zero-emission energy in its portfolio, resulting in an emission at one seventh of PG&E's.

For CY 2020, PG&E anticipates the emission factor to reduce to 290 lbs of CO_2 e /MWh. As PWRPA continues to increase qualified renewables into its portfolio, staff anticipates the emission factors to remain lower than PG&E's emission factor.

Scope 3 Emissions

Because over 55% of the District's water supply is imported, staff also included emissions related to importing water to the county as Scope 3 emissions. Emission factors for imported water are provided by the Department of Water Resources, Bureau of Reclamation and assumptions for San Francisco Public Utilities Commission's gravity feed system.

Scope 3 also includes emissions from employee commute and business travel , and are calculated based on accounting data and online tools developed by rideshare.511.org and enviro.berkeley.edu/aircalculator.

Total Carbon Footprint

Table 2 below summarizes the District's Scope 1, 2 and 3 carbon footprint. Emissions from energy uses for three treatment plants, local pumping and office/lab builidings is 2,177 MT of CO_2 e/Year, 8% of the total.

About two thirds of imported water is conveyed to the County using zero emission hydropower from the federal Central Valley Project, and gravity feed from San Francisco Public Utility Commission's Hetchy Hetchy system. A large portion of energy for the State Water Project is also from zero emission hydropower. For CY 2010, the State Water Project's emission factor is 0.46 Metric Tons/Acre Feet (AF). Table 2 estimates the District's carbon footprint to be 28,400 MT for CY 2010 and 37,200 MT for CY 2020, respectively.

Table 2. Summary of Carbon Footprint (in Metric Tons of CO_2 e (MT)/Year)

Sources	2010	2020
Scope 1 (Fleet)	2,200	
Scope 2 (Purchased Electricity)	2,200	
Scope 3 (District Defined)		
a. Import from State Water Project	21,100	
b. Import from Central Valley Water Project	0	
c. Import from SFPUC	0	
d. Employee Commute	1,500	
e. Business Travel	1,400	
Total Emissions	**28,400**	**37,200**

Carbon offsets

District's operations include activities that avoid or reduce carbon emissions, including water conservation, water recycling, renewable energy production, and the green business program. The District also invests in carbon sequestration through preserving, maintaining, restoring or enhancing wetlands/riparian habitats.

Though uncertainties exist when quantifying carbon offsets, staff anticipates that the list of sources for carbon offsets continues to expand. For example, as a part of Safe, Clean Water and Natural Flood Protection Program, the District is committing millions to reduce toxins, hazards and contaminants, and restore wildlife habitat and open space. These efforts could provide additional environmental carbon offsets.

Other District's activities can also be added to this list, as quantification methods become available. For example, City of San Jose developed a methodology for quantifying carbon offsets related to interconnected trails, and District's investments in trails could further expand carbon offsets.

Staff continues to monitor latest developments in accounting environmental carbon offset, and advocate for funding efforts to provide environmental carbon offsets to leverage investments in water conservation, recycling, stormwater rentention, and other climate smart practices.

Description of Methods Used for Accounting Offset

Though there are uncertainties related to accounting these environmental carbon offsets, to further S4.3.1.1, staff quantified these offset based on the following:

1. For water conservation and water recycling related avoidance or reductions, staff used estimates from the 2011 "*From Watts to Water*" Report. This report can be downloaded at http://www.valleywater.org/WorkArea/DownloadAsset.aspx?id=8418.
2. For Anderson Hydroelectricity and On-campus Solar production, staff used energy production data and PG&E's emission factor data to estimate carbon emissions avoided.
3. For wetlands and habitat related sequestration, staff used a sequestration rate of 0.7 Metric Tons/Acre Per Year. This is based on a 2007 Environmental Protection Agency Study providing a sequestration rate of 0.4 to 1.0 Metric Tons/Acre Per Year for riparian buffer. With this rate, staff collected acreage from the 2010 Stewardship Report; and applied a 25% efficiency rate for preservation or mitigation wetlands or riparian buffer sites based on the 3:1 ratio for mitigation;

4. For Green Business related avoidance or reductions, staff obtained data from 2012 recertification process and imposed a 25% multiplier to avoid double counting the benefits of water and energy conservation related offset estimated by the web-based tool developed by California Green Business Program.

Three Options For Accounting Water Conservation Related Carbon Offsets

Recognizing the uncertainties related to accounting for water conservation related carbon offsets, staff considered three options from this source:

Table 3. Options for accounting carbon offsets from water conservation programs

Options	Description
1. Carbon offsets from all water conservation savings	Carbon offsets from water savings that is directly attributable to District programs as well as savings from codes and/or new standards. The District's water conservation program is a key driving force for achieving all types of water conservation. Incentives motivate people to make changes. They also assist in market transformation and code/standard development.
*2. Carbon offsets from the District's water conservation program	Carbon offsets from water savings that is directly attributable to District programs. It does not include savings from codes and/or new standards. Staff calculated this to be about 25% of the Option 1 carbon offsets based on the District's conservation model that tracks active and passive water savings over time.
3. Carbon offsets from a portion of the District's water conservation program	Carbon offsets from a portion of the water savings that is directly attributable to District programs. The split is proportionally estimated based on the amount of the incentive versus the total cost of the device being rebated. Staff provided a rough estimate of a 50% split based on a weighted average of actual rebate amounts in 2010 versus the total cost of the individual devices.

Three Options for Accounting Carbon Offsets

Table 4 illustrates the estimated carbon offsets from all sources including the water conservation program. The water conservation program provides the greatest carbon offsets for the District.

Table 4. Preliminary List of Sources for Carbon offsets

Sources of Carbon offsets	2010	2020
A. Water Conservation Related Carbon offsets		
Option 1. All Water Conserved	*68,300*	*102,000*
Option 2. Programmatic Contribution	*17,000*	*25,500*
Option 3. Direct Investment	*8,500*	*12,700*
B. Other Non-Water Conservation Related Carbon offsets	*5,200*	*6,400*
1. Recycled Water	2,500	3,700
2. Hydroelectricity/Solar Production	100	100
3. Habitat/Wetlands	500	500
4. Green Business Program	2,100	2,100
C. Total Carbon offsets		
Option 1. All Water Conserved + Other	*73,500*	*108,400*
Option 2. Programmatic Contribution + Other	*22,200*	*31,900*
Option 3. Direct Investment + Other	*13,700*	*19,100*

*Board Chair requested that staff utilize Option 2 for all future water conservation.

Appendix E: Table of Goals, Strategies, and Possible Actions

Appendix E includes a list of the possible actions Valley Water can undertake to accomplish the Goals and Strategies of the CCAP. The status column indicates whether the action is already taking place at Valley Water (ongoing), if it is an expansion of Valley Water's current work (expand), or if it is an entirely new project (new). Finally, external collaboration refers to whether or not this project will require collaboration with external organizations or agencies.

	Status	External Collaboration
1. Goal 1: Reduce Direct Greenhouse Gas (GHG) Emissions (Scope 1)		
1.1. Strategy 1: Reduce GHG emissions associated with the Valley Water fleet.		
1.1.1. Continue adding Electric Vehicles or other fuel-efficient vehicles to fleet, as stated by existing board policy I-EL-5.11.a. xi..	Ongoing	No
1.1.2. Install additional Electric Vehicle chargers at Almaden Campus and at other offices.	Ongoing	No
1.1.3. Develop a Valley Water-wide Electric Vehicle Charger Policy that will promote employee EV use.	Ongoing	No
1.1.4. Expand the use of Valley Water pool vehicle(s) and Evaluate feasibility of having additional Valley Water pool vehicles available for employee work-use at south county facility (and at future drop-in locations if they are created).	New	No
1.1.5. Support the replacement or addition of high fuel efficiency and low emission vehicles when such choice is cost-effective and meets performance requirements.	Ongoing	No
1.1.6. Expand knowledge on vehicle emission reduction techniques, devices, and equipment. Add sustainability training to regular training offers.	New	No
1.2. Strategy 2: Reduce GHG emissions from trips between Valley Water offices and work sites.		
1.2.1. Improve availability of drop-in cubicles in multiple facilities.	Ongoing	No
1.2.2. Ensure that maintenance routes are optimized to minimize GHG emissions.	Ongoing	No
1.2.3. Develop a Valley Water-wide soil management plan to reduce truck hauling trips and encourage more efficient use of sediment/soil/spoils.	Ongoing	Yes

	Status	External Collaboration
1.2.4. Encourage remote and public transit options for off-site meetings, which may include adding a field in Off-site Training/Travel Request forms where employee must state if there is a remote or public transit option available.	New	No
1.2.5. Improve and maintain remote meeting technology throughout Valley Water. Provide training on use and management support of remote attendance.	Ongoing	Yes
1.2.6. Improve awareness of existing off-road diesel engine idling policy and consider expanding idling policy to other vehicles.	Ongoing	No
1.2.7. Promote fuel-saving policies and protocols such as, when safe, limiting hard braking while driving Valley Water vehicles, etc.	Ongoing	No
1.3. Strategy 3: Reduce GHG emissions associated with Valley Water-owned equipment.		
1.3.1. Replace diesel forklifts with electric forklifts (currently 60% of forklifts are electric)	Ongoing	No
1.3.2. Update diesel engines to comply with the Tier 4 diesel emissions government mandate. (Currently, Valley Water is one year ahead of the mandate's schedule).	Ongoing	No
1.3.3. Continue to replace less efficient equipment with more fuel-efficient Class 4 equipment (ex. generators, boats, other equipment, etc.) or devices that are powered by renewable energy (e.g., solar powered gages and monitoring devices).	Ongoing	No
1.3.4. Incorporate best practices to reduce emissions from natural gas (currently used in heating and cooling Valley Water facilities).	New	No
1.3.5. Promote use of renewable energy for Valley Water field monitoring equipment.	New	No
1.4. Strategy 4: Minimize GHG emissions associated with planning, design, construction, operation, and maintenance of capital projects.		
1.4.1. Incorporate new energy, water, and fuel efficient technologies into capital project planning and design. Minimize construction-related vehicle miles traveled.	Expand	No
1.4.2. Update internal capital project work instructions to incorporate GHG reduction measures, such as LEED/	New	No

	Status	External Collaboration
Envision certification elements, and considerations for continued maintenance with input from capital project staff and O&M staff.		
1.4.3. Provide recommendations to change internal capital project specifications through the Technical Review Committee to reduce GHGs and add fleet and equipment specifications for contractors.	New	No
1.4.4. Promote knowledge on construction related emission reduction technologies, devices, and equipment. Provide training to support capital project resiliency.	New	No
1.4.5. Incorporate process-based geomorphic channel designs into capital projects and utilize natural energy and local materials.	New	No
1.5. Strategy 5: Increase GHG sequestration in Valley Water properties and other areas.		
1.5.1. Identify native and drought tolerant plants with high sequestration rates and promote the use of these species in mitigation, enhancement, and landscaping projects, including at Valley Water offices.	Ongoing	No
1.5.2. Evaluate the need for purchasing carbon offsets to sequester carbon in non-Valley Water areas, such as in the Sacramento-San Joaquin Delta region, as a method for maintaining carbon neutrality.	New	No
1.6. Strategy 6: Continue to update Valley Water's GHG accounting practices.		
1.6.1. Follow the latest protocols to calculate direct (Scope 1) emissions from owned or controlled sources and receive third party verification of emissions.	Ongoing	No
1.6.2. Apply the best methodology and account for additional sources of direct emissions, such as biological processes from reservoirs, water treatment, fugitive emissions, capital project construction, infrastructure maintenance and repair, etc.	Expand	No
1.6.3. Continue to update the accuracy of Valley Water's sequestration calculations by using best available habitat-specific sequestration rates for Santa Clara County or analagous habitat types and, as appropriate, expand sources for sequestration to include in Valley Water's contribution to regional habitat restoration efforts.	Expand	Yes

	Status	External Collaboration
1.6.4. Evaluate the benefits of preparing a qualified Greenhouse Gas Reduction Plan that meets the requirements of CEQA Guidelines §15183.5, which would allow streamlining of project specific GHG analyses in subsequent CEQA documents.	New	Yes
2. <u>Goal 2: Expand Renewable Energy Portfolio and Improve Energy Efficiency (Scope 2)</u>		
2.1. Strategy 1: Increase the percentage of renewable energy in the agency's energy portfolio.		
2.1.1. Continue to procure carbon-free and renewable energy from the Power and Water Resources Pooling Authority (PWRPA).	Ongoing	Yes
2.1.2. Examine and pursue opportunities to increase renewable energy in Valley Water's energy portfolio, in accordance with the latest Energy Optimization Plan.	Expand	Yes
2.1.3. Participate in the Community Choice Aggregation Program or other green power purchasing options.	Ongoing	Yes
2.2. Strategy 2: Improve energy efficiency at agency facilities.		
2.2.1. Update or expand the Energy Optimization Plan and other energy efficiency efforts. Regularly track the implementation of this plan and Valley Water's progress towards energy efficiency.	Ongoing	No
2.2.2. Continue to maintain status as a Certified Green Business. Expand associated energy and water saving measures.	Ongoing	No
2.2.3. Develop and implement a Valley Water LEED and/or Building Sustainability Policy, building on prior efforts.	Ongoing	No
2.2.4. Conduct regular energy assessments and encourage use of energy efficient technologies (including at the treatment plants, the Advanced Water Purification Center, and water pumping equipment).	Ongoing	No
2.2.5. Expand energy efficient lighting systems (e.g.: automatic light shutdowns, motion sensor lights, attaching task lights to timers, install more efficient bulbs).	Ongoing	No
2.2.6. Set office equipment such as multifunction printers to automatically enter Power Save Mode after inactivity.	Ongoing	No

	Status	External Collaboration
Switch to secure printing (printers require passwords) rather than individual printers for sensitive documents. Reduce office equipment when possible (such as physical servers).		
2.2.7. Promote sustainable workplace behavior (i.e. turning off computers and other devices at night).	Ongoing	No
2.2.8. Engage in outreach and information sharing at the local, regional, state, and national levels to promote energy efficiency both internally and in the water industry.	Ongoing	Yes
3. Goal 3: Reduce Indirect GHG Emissions (Scope 3)		
3.1. Strategy 1: Reduce emissions from Valley Water employee commutes.		
3.1.1. Expand alternative schedules, provide incentives for public transit and carpooling, and incentivize in-county housing for employees.	Ongoing	No
3.1.2. Develop policies and best practices to promote successful telework agreements and outcomes for compatible positions.	Expand	No
3.1.3. Expand use of laptops instead of desktops, file sharing platforms, and other appropriate technologies to support paperless work and meetings.	Expand	No
3.1.4. Provide incentives for staff to use public transportation and carpool and provide virtual attendance options for meetings/business trips.	Ongoing	No
3.1.5. Improve availability of drop-in cubicles in multiple facilities.	Ongoing	No
3.1.6. Install more bicycle lockers, shower facilities, and EV chargers.	Ongoing	No
3.2. Strategy 2: Reduce waste produced at facilities.		
3.2.1. Expand waste reduction measures as part of the Green Business program.	Expand	No
3.2.2. Reduce waste from Valley Water facilities. This includes reducing cafeteria waste, office waste, and chemical waste from treatment processes.	Ongoing	No

	Status	External Collaboration
3.2.3. Make double-sided printing a default setting and keep printing equipment in optimal performance condition to reduce waste from misprinting.	Ongoing	No
3.2.4. Expand electronic document management to minimize use of paper (ex. electronic routing forms such as DocuSign, Seamlessgov, LegiStar, CAS, Digital Library, making tablets available for document review in the field, etc.).	Ongoing	No
3.2.5. Develop an agencywide approach, such as a plan or a checklist, for diverting and minimizing waste generation.	New	No
3.3. Strategy 3: Create and expand other efforts to minimize indirect GHG emissions.		
3.3.1. Comply with Valley Water's environmentally preferable purchasing policy and promote awareness of green procurement processes.	Ongoing	No
3.3.2. Continue divesting from fossil fuel companies with significant carbon emissions potential.	Ongoing	No
3.3.3. Support and track DWR's efforts to lower the carbon intensity of imported water.	Ongoing	Yes
3.3.4. Support regional and state-level policies that would reduce GHG emissions.	Ongoing	Yes
3.3.5. Support employee engagement through the Green Team and other internal communication strategies.	Ongoing	No
3.3.6. Work with local agencies to determine solutions to reduce chemical use and waste while ensuring health and safety guidance/ standards are followed.	Ongoing	Yes
3.3.7. Promote awareness of low carbon footprint meal options, such as vegetarian meals and locally sourced items.	Ongoing	Yes
4. <u>Goal 4: Water Supply Adaptation</u>		
4.1. Strategy 1: Expand and diversify local water supplies.		
4.1.1. Develop potable reuse consistent with the Water Reuse Master Plan and Water Supply Master Plans.	Expand	Yes
4.1.2. Expand non-potable reuse as identified in the Water Reuse Master Plan and enhance collaboration with wastewater producers.	Expand	Yes
4.1.3. Collaborate on water reuse research projects.	Ongoing	Yes

	Status	External Collaboration
4.1.4. Expand on-site reuse, such as by exploring graywater decentralized system opportunities and by developing onsite reuse guidance principles for the BOD to consider.	Expand	Yes
4.1.5. Resolve regulatory challenges to innovative local water solutions and increase coordination on alternative water uses.	Expand	Yes
4.1.6. Increase local groundwater recharge through methods such as increasing South County recharge, increasing off-stream recharge capacity and associated conveyance, and planning to ensure pond maintenance restores recharge capacity.	Expand	Yes
4.1.7. Increase capture and infiltration of stormwater and floodwater. Implement green stormwater infrastructure projects to maximize runoff retention, including those identified in the Stormwater Resources Plans as having water supply benefits.	Expand	Yes
4.1.8. Expand collaboration with stormwater agencies and South County stormwater permittees on green infrastructure and stormwater infiltration to ensure groundwater quality is protected.	Expand	Yes
4.1.9. Consider other local water projects identified in the Water Supply Master Plan (WSMP).	Expand	Yes
4.2. **Strategy 2: Improve demand management and support water conservation efforts.**		
4.2.1. Support programs to reduce pipeline leakage.	Expand	Yes
4.2.2. Increase coordination between Valley Water, land use agencies, and water retailers on water demand and land use.	Expand	Yes
4.2.3. Engage in proactive, consistent, and coordinated drought and water shortage contingency planning.	Expand	Yes
4.2.4. Increase water conservation by methods such as encouraging climate appropriate landscapes.	Expand	Yes
4.2.5. Increase collaboration on land use issues and promote regulations related to water use efficiency and reuse.	New	Yes
4.3. Strategy 3: Increase reliability of imported water.		

	Status	External Collaboration
4.3.1. Collaborate on and support Sierra Nevada watershed protection projects, such as by researching opportunities for GHG mitigation credit and collaborating with Sierra Nevada agencies (e.g. Sierra Nevada Watershed Improvement Program).	New	Yes
4.3.2. Support and invest in regional and state watershed and policy solutions as identified in the Water Supply Master Plan.	Ongoing	Yes
4.3.3. Collaborate on imported water regional and statewide issues including Delta watershed management to protect critical imported water assets, reduce flood risk, and foster ecosystem health and connectivity.	Ongoing	Yes
4.3.4. Support state efforts to develop emergency preparedness plans to respond to large Delta levee failure events that threaten imported water supplies.	New	No
4.4. Strategy 4: Support efforts to maintain and enhance source water quality.		
4.4.1. Support improvements in local land management practices (in county) using the latest science and technology.	Ongoing	Yes
4.4.2. Promote and participate in state and regional collaborative projects with State Water Contractors, Department of Water Resources, US Bureau of Reclamation, California Department of Fish and Wildlife, and others focusing on source water quality throughout the state. Focus on wildfire effects, algal blooms, Delta water quality, and grants or financial support for water quality protection.	Expand	Yes
4.4.3. Promote integrated pest management, best management practices, and reduced pesticide use.	Expand	Yes
4.4.4. Enhance collaboration with wastewater agencies and publicly owned treatment works (POTWs) on source control and wastewater collection system maintenance to protect recycled water and groundwater	Expand	Yes
4.4.5. Conduct outreach to the public on water reuse and source water quality.	Expand	Yes
4.4.6. Support and enhance other local source water quality efforts.	Expand	Yes

	Status	External Collaboration
4.5. Strategy 5: Implement source water improvement and water treatment actions.		
4.5.1. Prepare a Source Water Quality Improvement Plan and develop modeling that predicts incoming water quality.	Expand	No
4.5.2. Plan, design, and construct alternate reservoir intake locations to adapt to changing water quality conditions.	Expand	No
4.5.3. Implement water quality improvement methods such as oxygenation to address climate impacts on reservoir water quality.	Ongoing	No
4.5.4. Design and develop invasive species control strategies for Valley Water's facilities and conveyance structures that are specific to the target organism (e.g. quagga and zebra mussels).	Expand	No
4.5.5. Expand the monitoring programs to address climate impacts on cyanotoxins.	Expand	No
4.5.6. Promote and participate in research projects related to climate change impacts on source water quality.	Expand	Yes
4.5.7. Study climate change impacts of tertiary treated water discharge on bay water quality (e.g. occurrence and fate of contaminants of emergent concern (CECs)).	New	Yes
4.5.8. Develop a sampling plan to assess water quality following wildfires to reduce wildfire threat to local water quality.	New	No
4.5.9. Provide rebates and grants for technology that reduces salt in wastewater.	Ongoing	No
4.5.10. Conduct a study to identify potential adaptive water treatment solutions that increase the resilience and flexibility of treatment systems to the impacts of climate change.	New	No
4.6. Strategy 6: Increase flexibility and resilience of water utility operations and assets.		
4.6.1. Develop storage, recharge, and conveyance options that support climate change adaptation efforts and are climate resilient.	Expand	No

	Status	External Collaboration
4.6.2. Develop asset maintenance plans that incorporate climate change solutions and improve the reliability of aging infrastructure.	Expand	No
4.6.3. Improve hydrologic forecasting to better adapt to changing hydrology and extremes.	New	No
4.6.4. Increase resiliency to climate change impacts that create risks for operations and water utility assets, such as through including small-scale mitigation and adaptation efforts in projects' O&M cycles.	Expand	No
4.6.5. Ensure that people, vehicles, and equipment can continue to access pipelines and other assets.	Ongoing	Yes
4.7. Strategy 7: Support ecological water supply management objectives.		
4.7.1. Develop climate resilient water supply options to support fisheries and other aquatic and stream-dependent resources.	Expand	Yes
4.7.2. Implement the Fisheries and Aquatic Habitat Collective Effort (FAHCE) operations and adaptive management to support fisheries' environmental conditions.	Ongoing	Yes
4.7.3. Continue to participate in statewide environmental flows discussions.	Ongoing	Yes
4.7.4. Participate in joint efforts with our partner water agencies and other state and federal agencies to support ecosystem restoration, research, and science-based water management for the SWP and CVP.	Ongoing	Yes
5. Goal 5: Flood Protection Adaptation in Santa Clara County		
5.1. Strategy 1: Minimize riverine flooding risks.		
5.1.1. Design and implement multi-benefit flood protection projects that increase channel conveyance capacity and improve ecosystem resilience while reducing maintenance needs.	Expand	No
5.1.2. Research innovative, climate-conscious approaches to flood protection.	Expand	Yes
5.1.3. Design, build, and maintain multi-benefit green stormwater infrastructure as part of Valley Water	New	Yes

	Status	External Collaboration
projects, such as those identified in the Storm Water Resource Plans.		
5.1.4. Create natural floodplain areas, stream-upland transition areas, and upland buffers around streams locally.	New	Yes
5.1.5. Expand procedures to plan and design capital projects for long-term stream resilience, including defining life-time costs, ensuring maintenance needs are defined and budgeted, ensuring documentation of mitigation and regulatory requirements, and training.	Ongoing	Yes
5.2. Strategy 2: Minimize flood risk in coastal areas.		
5.2.1. Continue to seek partnerships and expand coordination to enhance fluvial and coastal flood protection projects, consistent with the Natural Flood Protection (NFP) procedures, such as the South San Francisco Bay Shoreline Study[17,18], SFEI's Resilient by Design, and the South Bay Salt Pond Project.	Expand	Yes
5.2.2. Continue work on capital projects and coordination with cities to address sea level rise related flooding risks.	Ongoing	Yes
5.2.3. Identify and pursue projects that increase the connectivity of coastal habitats and preserve the transition zone between the Bay's shoreline and streams' tidal zones, including wetland restoration and ecotone levees.	New	Yes
5.2.4. Design coastal and Baylands flood protection projects that respond to sea level rise (e.g..: restoring coastal/ Baylands habitat, improving channel design and management as encouraged by SFEI Flood Control 2.0, etc.).	New	Yes
5.2.5. Coordinate regionally to consider managed retreat.	New	Yes
5.2.6. Install tidal gages to monitor and communicate rising sea levels.	Expand	Yes

[17] County of Santa Clara Office of Sustainability and Climate Action. 2015. *Silicon Valley 2.0: Climate Adaptation Guide.*

[18] The Shoreline Project is currently under construction and will provide FEMA protection for up to a 100 year storm event with 2.59 ft of sea level rise.

	Status	External Collaboration
5.2.7. Ensure regional collaboration in rising sea level efforts by continuing engagement with regional efforts such as Adapting to Rising Tides, CHARG and their One Bay Plan.	Ongoing	Yes
5.3. Strategy 3: Improve flood preparedness of people, property, and habitat.		
5.3.1. Use flood forecasts to collaborate on flood protection efforts such as watershed level Emergency Action Plans and flood warning systems, for vulnerable areas and populations (e.g.: homeless persons and disadvantaged communities).	New	Yes
5.3.2. Consider relocation, purchase and/or structure elevation of properties subject to recurring flooding risk, when possible.	New	No
5.3.3. Work with land use agencies to reduce vulnerability to flooding by minimizing development and prioritizing natural space in floodplains, such as through installing vegetated buffers along creeks and obtaining easements in priority areas for flood protection.	Expand	Yes
5.3.4. Continue to enhance monitoring and/or maintenance programs for levees and flood walls, such as through collaboration with local agencies and training EOC staff about flooding risk areas.	Ongoing	Yes
5.3.5. Continue to coordinate with stakeholders, land use agencies, and municipalities to develop appropriate levels of flood protection and improve resilience to flooding.	New	Yes
5.3.6. Consider board policy in collaboration with land use agencies and municipalities to improve resilience to flooding.	New	Yes
5.4. Strategy 4: Implement projects and plans to increase the flexibility and resilience of flood protection operations and assets.		
5.4.1. Identify options for flexible and adaptable changes to reservoir water level management to minimize risks associated with severe storm events.	Expand	No
5.4.2. Develop planning, design, and maintenance procedures that incorporate climate change solutions for climate related flood impacts.	New	No

	Status	External Collaboration
5.4.3. Develop asset management plans for flood protection assets that incorporate climate change solutions and promote adaptation, resilience, and flexibility.	Expand	No
5.4.4. Ensure that people, vehicles, and equipment can continue to access flood protection assets.	Ongoing	Yes
5.4.5. Implement flood protection activities as identified in One Water.	New	No
5.4.6. Implement projects that maximize streams' climate resilience. Update the SMP to consider fluvial geomorphological functions, decrease long-term maintenance, and improve resilience to climate change.	New	Yes
5.4.7. Implement projects from the Santa Clara Basin and South County Storm Water Resources Plans that provide flood benefits.	New	Yes
5.4.8. Collaborate with local municipalities to incentivize green storm water infrastructure with benefits for flood attenuation.	New	Yes
5.4.9. Consider board policy to collaborate with land use agencies and municipalities to improve watershed and flood plain assets under the additional stresses of climate change.	New	Yes
5.5. Strategy 5: Expand the use of flood forecasting and modeling tools in the planning and design of agency projects to maximize protection from flood risks.		
5.5.1. Expand existing procedures to include the latest climate change assumptions, such as the potential for flooding from increased flows due to climate change, in the planning of agency projects.	New	No
5.5.2. Model projected uncertainty in the frequency and magnitude of precipitation-related riverine and coastal flooding.	New	No
5.5.3. Leverage additional technologies to improve forecasting of storms, storm surges, and other events resulting from rising sea level and changing flood patterns[19].	New	No

[19] Valley Water's existing flood forecasting system, which is installed in some creeks in Santa Clara County, uses rainfall forecasts to predict creek hydrographs and anticipates flood risk a couple of days in advance. This system could be refined and installed in additional locations.

	Status	External Collaboration
5.5.4. Continue to leverage tools from FEMA, USGS, BCDC, and other agencies to determine existing levels and types of flooding risk and to identify areas at risk of coastal flooding due to SLR.	Ongoing	No
5.5.5. Continue coordination with stakeholders to enhance monitoring and/or maintenance programs for Valley Water assets, such as through expanding the use of rain and stream gauges to help identify areas at risk of overtopping or flooding during large storm events.	Expand	Yes
5.5.6. Update and expand the implementation of Flood Risk Reduction Studies, which include hydrology, hydraulics, geotechnical and remapping work of floodplain.	Expand	No
5.5.7. Ensure long-term planning for operations and maintenance to ensure stream resilience, including long-term budgeting, sequencing of various maintenance needs, and increased coordination.	Expand	No
5.5.8. Develop a consistent methodology to track and document maintenance, regulatory and mitigation needs of stream assets, including defining workflows, procedures for data collection and sharing, coordination between O&M units, and development of training for staff.	New	No
6. Goal 6: Ecosystem Adaptation in Santa Clara County		
6.1 Strategy 1: Protect and enhance riverine, coastal, and other watershed ecosystems to improve climate change resilience.		
6.1.1. Protect, restore, enhance, create, and maintain wetlands and riparian areas and acquire additional land adjacent to streams where beneficial.	Expand	Yes
6.1.2. Continue to complete Integrated Water Resources Master Plans for each watershed as part of the One Water program.	Continue	Yes
6.1.3. Using watershed profiles developed through One Water, identify and prioritize habitat enhancement needs and incorporate into stream stewardship and mitigation projects.	Expand	No

	Status	External Collaboration
6.1.4. Develop asset maintenance plans for ecosystem assets that incorporate climate change solutions such as adaptation, resilience, and flexibility.	Expand	No
6.1.5. Continue to effectively manage algal blooms in Valley Water's reservoirs, using natural methods like dyes and probiotics.	Expand	No
6.1.6. Implement habitat conservation and restoration activities, informed by climate-smart and climate-resilient best practices, throughout the watersheds Valley Water operates in, including upper watershed areas that drain to our creeks and baylands.	Expand	Yes
6.1.7. Continue to utilize excavated sediment to create and rehabilitate habitat, including ecotone levees in coastal areas.	Ongoing	Yes
6.1.8. Continue to protect the climate resiliency of open spaces with regional partners, such as through collaboration with the Valley Habitat Agency, the Santa Clara County Open Space Authority, and the Mid-Peninsula Regional Open Space District.	Ongoing	Yes
6.1.9. Protect biodiversity through developing climate smart wildlife corridors in collaboration with regional and local agencies.	New	Yes
6.1.10. Consider BOD policies that promote environmental stewardship principles to address climate change impacts (e.g. improve land connectivity, watersheds, and green stormwater infrastructure).	New	No
6.1.11. Collaborate with land use agencies and municipalities to improve watershed and flood plain management and related goals and activities that increase climate change adaptability.	Expand	Yes
6.1.12. Improve operations to improve water quality for ecosystems, including by collaboration with land use agencies and municipalities.	New	Yes
6.2. Strategy 2: Develop and expand programs and plans that support more climate-resilient ecosystems.		
6.2.1. Establish political and legal mechanisms for mutually beneficial inter-agency programs, plans, and projects that restore regional ecosystems.	Expand	Yes

	Status	External Collaboration
6.2.2. Continue to support and expand funding partnerships with regional land conservation and management agencies to promote landscape-scale habitat linkages and preserve conservation values.	Expand	Yes
6.2.3. Consider Board policies to promote the protection and enhancement of habitat connectivity when planning, designing, operating, and maintaining Valley Water's flood protection and water supply infrastructure.	Ongoing	No
6.2.4. Implement actions related to ecosystem connectivity and resilience that are included in plans and programs such as the Stream Corridor Priority Plans (SCPP), the Stream and Watershed Protection Program, and One Water.	Expand	Yes
6.2.5. Expand grant program to encourage wildlife habitat restoration and watershed stewardship in Santa Clara County.	New	Yes
6.2.6. Improve aquatic habitat connectivity through the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) and other programs and projects.	Ongoing	Yes
6.2.7. Continue to move towards a geomorphic watershed approach when designing streams.	Expand	No
6.2.8. Participate in statewide coordination on managing functional environmental flows in a climate-responsive manner.	Ongoing	Yes
6.2.9. Promote climate-smart planting, such as by coordinating with the Valley Habitat Agency to include climate-smart planting palettes in the Valley Habitat Plan.	New	Yes
6.2.10. Avoid the spread of invasive species through prevention and removal efforts.	Ongoing	Yes
6.2.11. Coordinate with cities, the County of Santa Clara, and landowners to develop wildfire burn rehabilitation plans.	New	Yes
6.2.12. Develop Best Management Practices to reduce erosion and runoff following wildfire.	New	No
6.2.13. Expand the Guidelines & Standards for Land Use Near Streams (Water Resources Protection Collaborative) to include climate change resilience considerations.	Expand	Yes

	Status	External Collaboration
6.3. Strategy 3: Expand the availability of data on regional ecosystems in order to avoid detrimental climate change-related ecosystem impacts.		
6.3.1. Continue and improve monitoring and land management activities to ensure preservation of conservation values throughout the county, particularly in the upper watershed.	Ongoing	Yes
6.3.2. Understand climate impacts on invasive and problematic species and pathogens in order to guide efforts at prevention and removal.	Ongoing	Yes
6.3.3. Monitor and model the effects of climate change-related events (e.g. droughts and wildfires) on ecosystems, stream flows, and water quality to avoid detrimental impacts such as algal blooms.	Expand	No
6.3.4. Continue collecting baseline information about natural assets to be shared between regional stakeholders for the purpose of guiding future restoration activities.	Expand	Yes
6.3.5. Continue to monitor and assess stream and watershed ecological conditions, using the California Rapid Assessment Method (CRAM) or other appropriate methods, to provide information about ecosystem changes over time.	Ongoing	No
6.3.6. Add depressional wetlands (ponds), lacustrine wetlands (vegetated margins of lakes and reservoirs), and tidal Baylands to ambient condition surveys conducted for the Safe, Clean Water Program's Project D5 (Ecological Data Collection and Analysis).	Ongoing	No
6.3.7. Promote and participate in research projects related to climate impacts on Valley Water's mission areas, including watershed studies, ecological conditions, impacts of wildfire on water quality, and other topics.	New	Yes
7. <u>Goal 7: Emergency Preparedness</u>		
7.1. Strategy 1: Maximize Valley Water's emergency preparedness for climate related impacts (e.g.: from flooding, extreme heat events, fire, severe storms).		
7.1.1. Develop a centralized approach for data and projections (e.g., preferred general circulation models (GCMs), representative concentration pathways	Ongoing	Yes

	Status	External Collaboration
(RCPs), downscaling methods, etc.) for use throughout Valley Water to assess, predict, and respond to climate change impacts.		
7.1.2. Improve operational flexibility and agility in responding to climate change related emergencies, including by updating emergency action plans and emergency drill procedures.	Expand	No
7.1.3. Improve staff training about responding to and addressing climate-related disasters.	Expand	No
7.1.4. Improve communication to the public about climate-related disasters.	Expand	Yes
7.1.5. Assess and ensure backup power reliability, including generator and fuel availability.	Expand	No
7.1.6. Ensure assets are equipped to handle climate-related emergencies such as increased heat.	Expand	No
7.1.7. Continue engagement with the Santa Clara County Emergency Managers Association.	Ongoing	Yes

Valley Water

Clean Water • Healthy Environment • Flood Protection

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